

Joint Services Small Arms Systems Annual Symposium,
Exhibition and Firing Demonstration

Virginia Beach, VA
"Meeting the Needs of Our Joint Ground Forces in the Fight Against Terrorism and Developing the Tools for Future Combat"

7-10 May 2007

Tuesday, 8 May 2007

Keynote Address: Mr. George Solhan, Office of Naval Research

Panel: *Joint Service Small Arms Synchronization Team (JSSAT)*

Chairman: COL Scott Crizer, USA

- COL Robert Radcliffe, USA, Army Member
- CAPT Rick Ruehlin, USN, *"Navy Small Arms"*, Navy Member
- Col Charles Beck, USAF, *"USAF Combat Weapons Program"*, Air Force Member
- LtCol Tracy Tafolla, USMC, *"Marine Corps Weapons"*, Marine Corps Member
- CDR Jim Olive, USCG, *"Office Of Counterterrorism & Special Missions Operations"*, Coast Guard Member
- Mr. Kevin Swenson, *"JNLWP Update to the Joint Service Small Arms Symposium "*, Joint Non-Lethal Weapons Directorate Member

Small Arms Section Awards 2007

- Mr. Bill Dittrich, Recipient, Chinn Award

Panel: *Soldier Weapons*

Chair: COL Carl Lipsit, USA, PM Soldier Weapons

- *"Project Manager Soldier Weapons Overview For the Small Arms Symposium & Exhibition"*, Mr. Richard Audette, Deputy PM Soldier Weapons
- *"PM Individual Weapons Overview for the Small Arms Symposium & Exhibition,"* LTC Timothy Chyma, USA, PM Individual Weapons
- *"Project Manager Soldier Weapons Rapid Fielding Initiative (RFI) Update"*, Mr. Michael Friedman, PM Soldier Weapons

Session I: *Individual Weapons & Supporting Equipment*

- *"Requirements to Current & Future Small Arms"*, Mr. Wolfgang Bantle, Heckler & Koch
- *Weapon Shot Counter (WSC)"*, Mr. Jason Davis, Naval Surface Warfare Center, Crane Division
- *"USSOCOM SOPMOD – Miniature Day/Night Sight Development Program"*, Mr. Barry Gatewood, Naval Surface Warfare Center, Crane Division
- *"Miniature Day/Night Sight-Crew Served Weapons (MDNS-CSW)"*, Mr. Mike Jones, Naval Surface Warfare Center, Crane Division
- *"Miniature Red Dot Sight"*, Mr. Rick Tousignant, Naval Surface Warfare Center, Crane Division
- *"Possible Business Opportunities Within The SOF Weapons Program"*, Mr. Troy Smith, Naval Surface Warfare Center, Crane Division

Session II: *Small Arms Ammunition & Technology*

- *"St. Marks Powder, A General Dynamics Company"*, Mr. Bruce Webb, VP Marketing
- *".338 Lapua Magnum, A "New" Cartridge Comes of Age"*, Mr. Bruce Webb, VP Marketing
- *"Lightweight Small Caliber Ammunition"*, Mr. Lucian Sadowski, US Army ARDEC and Mr. Mark Leng, Armament Engineering & Technology Center
- *"Baselining of the 40mm Family of Ammunition"*, Mr. James Grassi and US Army ARDEC
- *"Non-Toxic, Heavy Metal-Free Primer for Small Arms Cartridges – Red Phosphorous Based Introducing ATK Lake City's P4rimer "*, Mr. Randall Busky, ATK Lake City Ammunition Division

Wednesday, 9 May 2007

Session III: *Joint Service Small Arms Program Update*

- *"Lightweight Small Arms Technologies Update"*, Ms Kori Spiegel, US Army ARDEC
- *"Knight's Armament Company TODAY"*, Mr. George Kontis, Knights Armament Company
- *"National Small Arms Technology Consortium (NSATC)"*, Mr. Jean-Louis Vanderstreatan, CEO, FNMI
- *"Joint Services Small Arms Technology Plan"*, Mr. John Edwards, US Army ARDEC, JSSAP Office

Panel: *Industry Perspective*
Chair: Mr. Dave Broden, Chairman, Armaments Division, NDIA

Session IV: *NATO*

- *"AC/225 Land Capability Group 1 Dismounted Soldier"*, Mr. Vernon Shisler, US Army ARDEC, JSSAP Office
- *"NATO Small Arms Ammunition Interchangeability via Direct Evidence Testing"*, Mr. Lascelles Geddes, III, US Army ARDEC
- *"Interoperability and Integration of Dismounted Soldier System Weapon Systems"*, Mr. Mark Richter, Marine Corps Systems Command

Luncheon Speaker: *"M14 to MK 14 – Evolution of a Battle Rifle", Mr. David Armstrong, Naval Systems Warfare Center, Crane Division*

Session IV: *NATO (Continued)*

- *"NATO Army Armaments Group (NAAG) Quick Reaction Team (QRT) for Nonlethal Weapons"*, MAJ Kevin Finch, US Army Infantry School, Fort Benning
- *"NATO Military Operations in Urban Terrain"*, Mr. Vernon Shisler and *"Topical Group 3 on Operations on Urban Terrain"*, LtCol Eric de Saint-Salvy, NATO AC-225 TG/3
- *" What You Can do For Them Today, What You Can do For Them Tomorrow"*, LTC Keith Cook, UK Army (Ret), MBE, System Design Evaluation, Ltd

Session V: *Crew Served Infantry Weapons & Equipment*

- *"FCS SDD-449 Close Combat Armament System (CCAS) Trade Study – Performance Assessment"*, Mr. Andrew Clark, US AMSAA
- *"XM307 ACSW Dual Feeder and Receiver Design Rough Handling"*, Mr. Brian Hatin, General Dynamics Armament & Technical Products
- *"Heavy Machinegun Fire Control as a Distributed Operations Enabler"*, Mr. Joseph Brus, Naval Surface Warfare Center, Crane Division

Session VI: *Modeling & Simulation*

- *"Small Arms & Dismounted Infantry Modeling With the Infantry Warrior Simulation (WARS)"*, Ms Alicia Borgman, General Dynamics Information Technology
- *"Modeling & Evaluation of the Human Torso Model"*, Mr. Andrew Merkle, John Hopkins University, Applied Physics Laboratory
- *"Mechanical System Simulation of the XM 307 Crew Served Weapon"*, Ms. Callista Rodriguez, General Dynamics Armament & Technical Products
- *"Transforming Small Arms Maintenance Training Through Virtual Task Trainers"*, Mr. Troy Welch, NGRAIN Corporation

Thursday, 10 May 2007

"NDIA Armaments Division Status Overview", Mr. Dave Broden, Chairman, Armaments Division, NDIA HQ TRADOC

Session VII: *PM Maneuver Ammunition System*

Chair: *"Meeting the Needs of our Joint Ground Forces"*, COL Mark Rider, USA, PM Maneuver System

Session VIII: *Less Than Lethal Systems & Technology*

- *"40 mm Less Lethal Munitions"*, Mr. Keith Olasin, Mechanical Solutions, Inc
- *"40 mm XM1112 Airburst Non-Lethal Munition (ANLM)"*, Mr. Nicholas Grossman, US Army ARDEC
- "Joint Harmonization of Testing Update", Ms. Lilliana McShea, US Army ARDEC
- *"Swedish Fire Control System Development"*, Mr. Per G. Arvidsson, Product Manager, Small Arms Systems

Joint Services Small Arms Systems Annual Symposium, Exhibition & Firing Demonstration



"Meeting the Needs of Our Joint Ground Forces in the Fight Against Terrorism"

Conference Agenda

Event #7610

May 7 - 10, 2007

The Virginia Beach Convention Center

Virginia Beach, VA

NDIA
NATIONAL DEFENSE INDUSTRIAL ASSOCIATION
STRENGTH THROUGH INDUSTRY & TECHNOLOGY



Joint Services Small Arms Systems Annual Symposium, Exhibition & Firing Demonstration

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Virginia Beach, VA

NDIA
NATIONAL DEFENSE INDUSTRIAL ASSOCIATION
STRENGTH THROUGH INDUSTRY & TECHNOLOGY

OVERVIEW: The Joint Services Small Arms Systems Annual Symposium, Exhibition & Firing Demonstration, "Meeting the Needs of our Joint Ground Forces in the Fight Against Terrorism," will be held at the Virginia Beach Convention Center, Virginia Beach, VA. This Symposium is a premier event where the Small Arms communities come together for technical paper presentations, informational speakers and exhibits of the hardware used by current and future defense organizations. A firing demonstration is scheduled for May 10, 2007. The Symposium is expected to draw law enforcement, government, industry and international participants, in addition to a strong representation from all branches of the military. NDIA looks forward to seeing you in Virginia Beach.



OBJECTIVE: Achieving a secure environment for the American people requires a strong resolve in the diplomatic arena and a stronger fortitude to back it up. Facing terrorist forces from MOUT to the open battlefield, American forces, both military and law enforcement alike, require the best equipment available. Only through the efforts of Government and Industry focusing together on the immediate needs of current operations and "lessons learned" and applying the emerging advanced technology and system integration approaches will the tools necessary to support our warriors now and in the future be realized. This Symposium seeks to bring together government and industry, manufacturers and users to support this objective for the military and law enforcement communities.

"The Department of Defense finds this event meets the minimum regulatory standards for attendance by DoD employees. This finding does not constitute a blanket approval or endorsement for attendance. Individual DoD component commands or organizations are responsible for approving attendance of its DoD employees based on mission requirements and DoD regulations."

Symposium Registration & Event Information

Symposium Registration Fees

	Early Before 3/26/07	Regular 3/26/07-4/23/07	Late/Onsite After 4/23/07
Government/ Academia/ Allied	$625	$690	$760
NDIA Industry Member	$725	$795	$875
NDIA Industry Non-Member	$760	$845	$930

The Symposium registration fee includes attendance at all sessions, continental breakfasts, exhibits, lunches, receptions, firing demonstration and administrative costs. Registrations will not be taken over the phone. Payment must be received at the time of registration.



Registration Information: Online registration will close at 5:00pm on April 23, 2007. To register online for this Symposium, please visit the following link: http://www.ndia.org/meetings/7610. You must register onsite after this date. You can also download the registration form from the NDIA website or complete the form contained in this brochure. Fax the completed form to: (703) 522-1885 or mail to: Event #7610, National Defense Industrial Association, 2111 Wilson Boulevard, Suite 400, Arlington, VA 22201-3061. Please do not fax or mail registration forms after April 23, 2007. You will need to register onsite after this date. Payment must be made at the time of registration. Registrations will not be taken over the phone.

Cancellations Policy: Cancellations received in writing before March 26, 2007 will receive a full refund. Cancellations received from March 26, 2007 until April 23, 2007 will receive a refund minus a cancellation fee of $75.00. REFUNDS WILL NOT BE GIVEN FOR CANCELLATIONS RECEIVED AFTER APRIL 23, 2007. Substitutions are welcome in lieu of cancellations.

Attire: Appropriate dress for this Symposium is business casual attire for civilian and class B uniform or uniform of the day for military.

ID Badges: During Symposium registration and check-in, each participant will be issued an identification badge. Please be prepared to present a picture ID. Badges must be worn at all Symposium functions.

Proceedings: Proceedings will be available on the web through the Defense Technical Information Center (DTIC) and will be available approximately 1-2 weeks after the Symposium. You will be notified via e-mail of the proceedings link where they will be posted and available on the web.

Attendee Roster: An attendee roster will be distributed at the Symposium. In order for your name to appear in the Symposium attendee roster, you MUST register by April 23, 2007. There will be NO additional updated versions.

Special Needs: NDIA supports the Americans with Disabilities Act of 1990. Attendees with special needs should call (703) 522-1820 and refer to the Joint Services Small Arms Systems Annual Symposium, Exhibition and Firing Demonstration, Event #7610, prior to April 23, 2007.

National Defense Magazine: Advertise in National Defense Magazine and increase your company's exposure at this event. National Defense will be distributed to attendees of this Symposium as well as other NDIA events. For more information, contact Dino Pignotti at (703)247-2541 or dpignotti@ndia.org.

Inquiries: For questions, please contact Carissa Mirasol, Meeting Planner, at cmirasol@ndia.org or at (703) 247-2588. You may also visit the Symposium website at http://www.ndia.org/meetings/7610.

Symposium & Hotel Information



A Firing Demonstration is scheduled for **Thursday, May 10, 2007.** Companies interested in participating in the Live Fire Demonstration should contact Sal Fanelli at (703) 432-4949 or salvatore.fanelli@usmc.mil.

Promotional Partnership Opportunity

Increase your company or organization's exposure at this premier event by becoming a Promotional Partner! A Promotional Partnership will add your company name to the back cover of the on-site brochure as well as main platform recognition throughout the Symposium, signage at all events including the opening reception, a 350-word organization description in the on-site brochure and a hotlink from the symposium webpage to your company website. For more information, please contact Carissa Mirasol at (703) 247-2588 or cmirasol@ndia.org.

Hotel Information

A block of rooms have been reserved at the hotels listed below. To make your reservation, please call any of the hotels directly. In order to ensure the discounted NDIA rate, you must make your reservations early and ask for the "NDIA - Small Arms Symposium" room block. Rooms will not be held after Friday, April 13, 2007 and may sell out before then. Rates are also subject to increase after this date.

** If you book a 3 or more night stay at any of the four Symposium hotels listed below, your name will be entered into a drawing to win a prize of $100.00!! The drawing will take place on Thursday, May 10, 2007 during the Symposium wrap-up session. You need not be present to win **

The Courtyard Marriott
2501 Atlantic Avenue
Virginia Beach, VA 23451
(757) 491-6222
Government Rate: $84.00*
(Single/Double)
Industry Rate: $134.00 (Single/Double)

Fairfield Inn & Suites
1901 Atlantic Avenue
Virginia Beach, VA 23451
(757) 422-4885
Government Rate: $84.00*
(Single/Double)
Industry Rate: $115.00 (Single/Double)

Sheraton Oceanfront Hotel
3501 Atlantic Avenue, 36th Street & Atlantic Avenue
Virginia Beach, VA 23451
(757) 425-9000
Government Rate: $84.00*
(Single/Double)
Industry Rate: $149.00 (Single/Double)

Double Tree Hotel - Virginia Beach
1900 Pavilion Drive
Virginia Beach, VA 23451
(757) 422-8900
Hotel Rate: $84.00*

* or the government per diem rate available at the time of the Symposium. The government per diem rate is available only to active duty or civilian government employees. ID will be required upon check-in. Retired military ID's do not qualify.

Program Agenda

Monday, May 7, 2007

9:00 AM-4:00 PM	**Registration and Exhibits Set-Up**
5:00 PM-6:30 PM	**Opening Reception in the Exhibit Hall**

Tuesday, May 8, 2007

7:00 AM	**Registration and Continental Breakfast**
7:55 AM	**Welcome and Administrative Announcements** *Mr. Sam Campagna, Director, Operations, NDIA* *Mr. Brian Berger, Chairman, Small Arms Committee, Vice President Business Development, General Dynamics OTS Simunition Development*
8:05 AM	**National Anthem**
8:10 AM	**Welcome Address** *TBD*
8:20 AM	**Keynote Address** *Mr. George Solhan, Office of Naval Research*
8:40 AM	**Joint Service Small Arms Synchronization Team (JSSAST)** *- COL Scott Crizer, USA, Chairman, JSSAST, Commander Armament Systems Integration Center, US Army ARDEC, Picatinny Arsenal* *- COL Robert Radcliffe, USA, Army Member* *- CAPT Rick Ruehlin, USN, Navy Member* *- Col Charles Beck, USAF, Air Force Member* *- LtCol Tracy Tafolla, USMC, Marine Corps Member* *- CDR Jim Olive, USCG, Coast Guard Member* *- COL Kevin Noonan, USA, SOCOM Member* *- COL Carl Lipsit, USA, PM Soldier Weapons Associate Member* *- Mr. Kevin Swenson, Joint Non-Lethal Weapons Directorate Member*
10:00 AM	**Morning Refreshment Break in the Exhibit Hall**
10:30 AM	**Small Arms Section Awards 2007** *Chinn Award* *Recipient: Mr. Bill Dittrich* *Presenter: Mr. Brian Berger* *Hathcock Award* *Recipient: American Sniper Organization* *Presenters: Mr. William "Bart" Bartholomew and Mr. Russ Logan* *NDIA Professional Service Awards* *Recipient: COL Mark Rider, USA* *Presenter: Mr. William Sanville* *Recipient: COL Scott Crizer, USA* *Presenter: Mr. Joel Goldman* *Recipient: Mr. Richard Audette* *Presenter: Mr. Brian Berger*
11:40 AM - 1:10 PM	**Luncheon**
	(12:40 PM) Luncheon Speaker **Hiram Maxim and His Machinegun: A Great Force Harnessed to a Useful Purpose** *Dr. Stephen Small, JSSAP/ARDEC*

Tuesday, May 8, 2007
(Continued)

1:10 PM	**Soldier Weapons - PANEL** *Chair: COL Carl Lipsit, USA, PM Soldier Weapons* *Panel: Mr. Richard Audette, Deputy PM Soldier Weapons* *LTC Timothy Chyma, USA, PM Individual Weapons* *LTC Michael Ascura, USA, PM Crew Served Weapons*
2:10 PM	Session I - Individual Weapons & Supporting Equipment **Session Chairman: Mr. George Kontis, Vice President of R&D, Knights Armament Company** **Requirements to Current & Future Small Arms** *Mr. Wolfgang Bantle, Heckler & Koch*
2:30 PM	**USSOCOM Small Arms Accessories - SOPMOD** *Mr. Gus Taylor, Naval Surface Warfare Center, Crane Division* *Mr. Jason Davis, Naval Surface Warfare Center, Crane Division*
3:00 PM	**USSOCOM Miniature Day/Night Sight Developments** *Mr. Barry Gatewood, Naval Surface Warfare Center, Crane Division* *Mr. Mike Jones, Naval Surface Warfare Center, Crane Division* *Mr. Rick Tousignant, Naval Surface Warfare Center, Crane Division*
3:30 PM	**Afternoon Refreshment Break in the Exhibit Hall**
4:00 PM	Session I - Individual Weapons & Supporting Equipment **(Continued)** **Business Opportunities Within the SOF Weapons Program** *Mr. Troy Smith, Naval Surface Warfare Center, Crane Division*
4:20 PM	Session II - Small Arms Ammunition & Technology **Session Chairman: Mr. Jim Taylor, ATK LCAAP** **Lightweight Small Caliber Ammunition** *Mr. Lucian Sadowski, US Army ARDEC* *Mr. Mark Leng, Armament Engineering & Technology Center*
4:40 PM	**.338 Lapua Magnum Design Efforts** *Mr. Chuck Marsh, Naval Surface Warfare Center, Crane Division* *Mr. Matt Kretlow, US Army ARDEC*
5:00 PM	**Baselining of the 40mm Family of Ammunition** *Mr. James Grassi, US Army ARDEC*
5:20 PM	**P4rimer: A Red Phosphorus Fueled, Non-Toxic, Heavy Metal-Free Primer for Small Arms Cartridges** *Mr. Randall Busky, ATK Lake City Ammunition Division*
5:40 PM -7:40 PM	**Evening Reception in the Exhibit Hall**

Program Agenda
Wednesday, May 9, 2007

7:00 AM	**Registration and Continental Breakfast**
7:45 AM	**Administrative Announcements** *Mr. Sam Campagna, Director, Operations, NDIA* *Mr. Brian Berger, Chairman, Small Arms Committee, Vice President Business Development, General Dynamics OTS Simunition Development*
7:50 AM	**Keynote Address** *LtGen Robert Blackman, USMC, Commander, Marine Forces Command (Invited)*
8:20 AM	**NDIA Armament Division Status Overview** *Mr. Dave Broden, Chairman, Armament Division, NDIA*
8:30 AM	Session III - Joint Service Small Arms Program Update **Session Chairman: Mr. Joel Goldman, JSSAP, ARDEC** **Lightweight Small Arms Technologies Update** *Ms. Kori Spiegel, US Army ARDEC*
9:00 AM	**Thermal Management for Automatic Firearms** *Mr. George Kontis, Knights Armament Company*
9:20 AM	**NSAC - The Next Step** *Mr. Joel Goldman, JSSAP, US Army ARDEC* *Mr. Jean-Louis Vanderstraetan, CEO, FNMI* *Mr. Darold Griffin, EME, Inc.*
9:40 AM	**Joint Services Small Arms Technology Plan** *Mr. John Edwards, US Army ARDEC, JSSAP Office*
10:00 AM	**Morning Refreshment Break in the Exhibit Hall**
10:20 AM	**Industry Perspective - PANEL** *Chair: Mr. Dave Broden, Chairman, Armament Division, NDIA* *Panel: TBD*
11:00 AM	Session IV - NATO **Session Chairman: Mr. Vernon Shisler, US Army ARDEC, JSSAP Office** **NATO Soldier System Capabilities** *Mr. Vernon Shisler, US Army ARDEC, JSSAP Office*
11:20 AM	**NATO Small Arms Ammunition Interchangeability via Direct Evidence Testing** *Mr. Lascelles (Sandy) Geddes, III, US Army ARDEC*
11:40 AM	**Dismounted Infantry Weapon Activities in NATO** *Mr. Mark Richter, Marine Corps Systems Command*
12:00 PM - 1:30 PM	**Luncheon**
	(1:00 PM) Luncheon Speaker **M14 to MK 14 - Evolution of a Battle Rifle** *Mr. David Armstrong, Naval Surface Warfare Center, Crane Division*

Wednesday, May 9, 2007 (Continued)

1:30 PM	Session IV - NATO **(Continued)** **Non-Lethal Activities in NATO** *MAJ Kevin Finch, USA, US Army Infantry School, Fort Benning*
1:50 PM	**NATO Military Operations in Urban Terrain** *LtCol Eric de Saint-Salvy, NATO AC/225 TG/3*
2:10 PM	**"What You Can do For Them Today, What You Can do For Them Tomorrow"** *LTC Keith Cook, USA, MBE, System Design Evaluation, Ltd.*
2:30 PM	Session V: Crew Served Infantry Weapons & Equipment **Session Chairperson: Ms. Candice Campbell, General Dynamics Armament & Technical Products** **Future Combat System (FCS) Close Combat Armament System (CCAS) Weapon Alternatives - Performance Assessment** *Mr. Lewis Farkas, US AMSAA*
2:50 PM	**XM307 ACSW Dual Feeder and Receiver Design Rough Handling** *Mr. Brian Hatin, General Dynamics Armament & Technical Products*
3:10 PM	**Afternoon Refreshment Break in the Exhibit Hall**
3:40 PM	Session V: Crew Served Infantry Weapons & Equipment **(Continued)** **Nammo's Solution for Urban Operations** *Mr. Jarl Eirik Straume, Nammo Raufoss AS*
4:00 PM	**Heavy Machinegun Fire Control as a Distributed Operations Enabler** *Mr. Joseph Brus, Naval Surface Warfare Center, Crane Division*
4:20 PM	Session VI : Modeling & Simulation **Session Chairperson: Ms. Liliana McShea, US Army ARDEC** **Small Arms & Dismounted Infantry Modeling With the Infantry Warrior Simulation (WARS)** *Ms. Alicia Borgman, General Dynamics Information Technology*
4:40 PM	**Modeling & Evaluation of the Human Torso Model** *Dr. Jack Roberts, Johns Hopkins University, Applied Physics Laboratory* *Mr. Andrew Merkle, Johns Hopkins University, Applied Physics Laboratory*
5:00 PM	**Mechanical System Simulation of the XM 307 Crew Served Weapon** *Ms. Callista Rodriguez, General Dynamics Armament & Technical Products*
5:20 PM	**Transforming Small Arms Maintenance Training Through Virtual Task Trainers** *Mr. Gabe Batstone, NGRAIN Corporation*
5:40 PM	Conference Adjourns for the Day

Program Agenda
Thursday, May 10, 2007

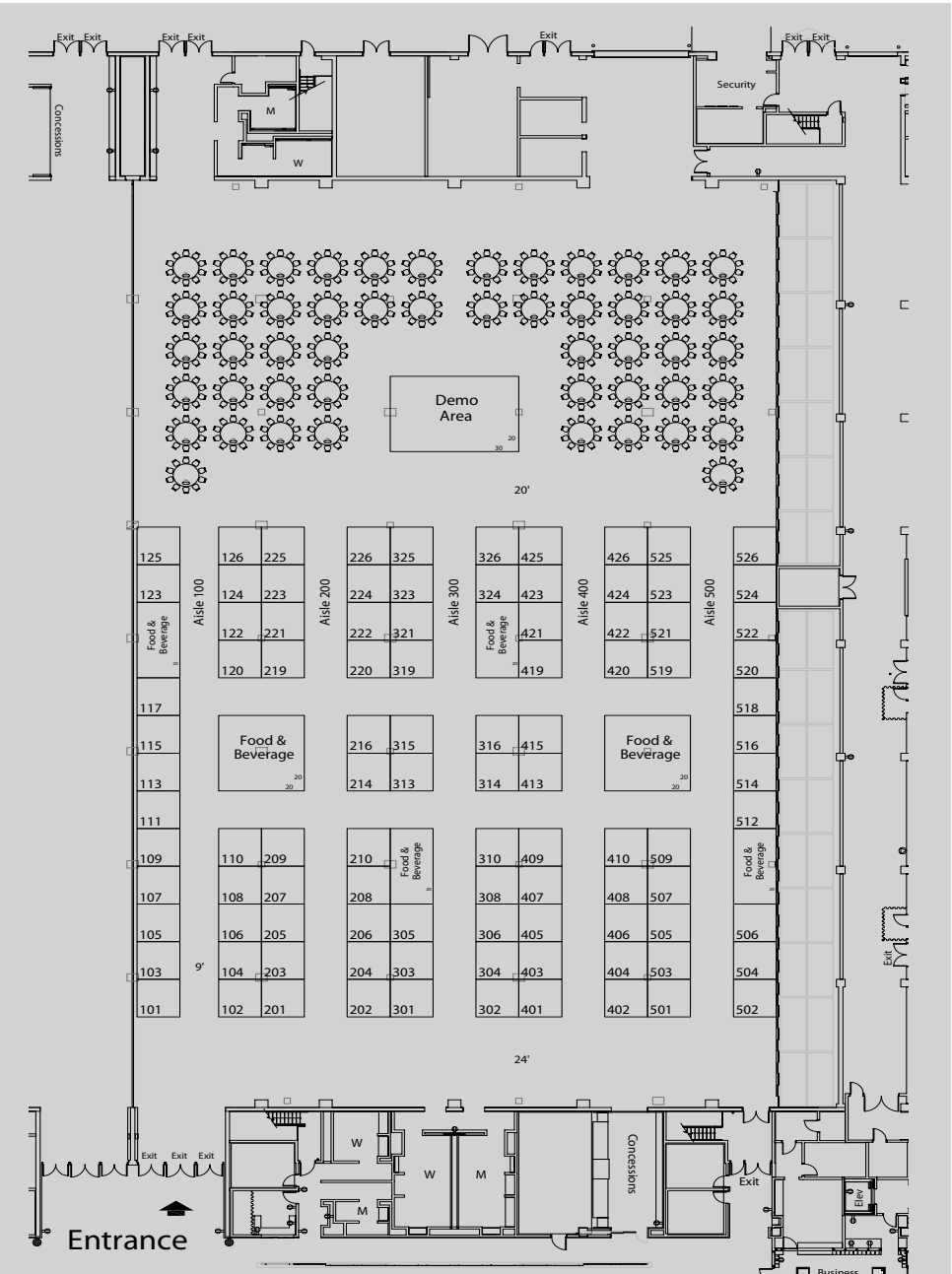
7:00 AM	**Registration and Continental Breakfast**
7:45 AM	**Administrative Announcements** *Mr. Sam Campagna, Director, Operations, NDIA* *Mr. Brian Berger, Chairman, Small Arms Committee, Vice President Business Development, General Dynamics OTS Simunition Development*
8:00 AM	**Keynote Address** *MG Richard Rowe, Jr., USA, Deputy Director, Army Capabilities Integration Center, HQ TRADOC (Invited)*
8:20 AM	Session VII: PM Maneuver Ammunition System **Session Chairman: COL Mark Rider, USA, PM Maneuver Systems** **LTC Eric Fletcher, USA, PM Small & Medium Caliber**
9:20 AM	Session VIII: Less Than Lethal Systems & Technology **Session Chairman: Mr. Kevin Swenson, JNLWD, Quantico**
9:40 AM	**40 mm Less Lethal Munitions** *Mr. Keith Olasin, Mechanical Solutions, Inc.* *Mr. Paul Boyadjis, Mechanical Solutions, Inc.*
10:00 AM	**Airburst Non-Lethal Munition** -
10:20 AM	**Joint Harmonization of Testing Non-Lethal Munitions** *Ms. Liliana McShea, US Army ARDEC*
10:40 AM	**Small Arms Fire Control - PANEL** *Chair: Mr. John Edwards, JSSAP, ARDEC* *Panel: TBD*
11:00 AM	**Closing Remarks** **(Adjourn to Buses for Lunch and Firing Demonstration)**
12:30 PM	**Lunch at Firing Range**
1:30 PM - 4:00 PM	Session IX: Contractor Firing Demonstration **Session Chairman: Mr. Sal Fanelli, US Marine Corps, Quantico** **FIRING DEMONSTRATION**
4:00 PM	**Buses Return to Conference Center - Conference Adjourns**

Exhibitor Information & Floorplan

Cost to Exhibit:
- NDIA Corporate Member*: $24.00/sq. foot
  * Rate applies to government agencies
- Non-Member: $29.00/sq. foot

Exhibit Rate Includes:
- Networking social functions in the Exhibit Hall
- Two complimentary registrations
- Symposium attendee roster
- Standard booth package of: side and back drape and company ID sign. No booth furnishings are included
- Company profile online
- 24-hour Exhibit Hall security, and secure after-hours weapons storage

Exhibit Personnel Registration:
For each exhibit space that your organization occupies at the 2007 Joint Services Small Arms Systems Annual Symposium and Exhibition, your organization will be entitled to two complimentary registrations. Your registration will allow admittance to all Symposium and exhibition events, including receptions, meal functions, and sessions.



Demo Area (New for 2007!):
New for this year, NDIA is pleased to offer a demonstration area for exhibiting companies to show off their latest products.

How will it work?
Exhibiting companies who choose to participate will be given a 15 minute time slot during one of the four coffee breaks or two receptions. The demonstrations will be promoted through announcements made both in the Exhibit Hall and in the General Session prior to the demonstration. This is a terrific avenue to give a preview of a product under development or to unveil a product to the industry for the first time.

Cost: $500.00 per 15 minute time slot.

New Product Showcase (New for 2007!):
In an effort to give exhibitors new and different ways to reach the attendees, NDIA is pleased to offer a New Product Showcase for the first time at the 2007 Joint Services Small Arms Systems Annual Symposium and Exhibition. For a nominal fee of just $500.00 per product, exhibitors will have space in a secure display case that will be placed prominently in the concourse of the Virginia Beach Convention Center between the General Session Room and the Exhibit Hall. A sign will be provided that will identify the product with a brief description along with the company name and booth number. Exhibitors will also receive a "New Product Showcase Exhibitor" designation for their booth space.

If the item being displayed is not freestanding, exhibitors will be responsible for providing their own display stand. Size and weight limitations may apply.

A "New Product" is defined as having been released since the last Joint Services Small Arms Systems Symposium.

Sponsorships and Promotional Partnerships
For those companies who wish to have a presence beyond that of an exhibit space, Sponsorship Opportunities and Promotional Partnerships are available. Check the NDIA Exhibits website for more detailed information on these terrific ways to make your companies presence known at this premier Small Arms event.

For more information or questions on exhibits, contact Luellen Hoffman at (703) 247-9460 or lhoffman@ndia.org.

To secure your booth space today, please visit: http://exhibits.ndia.org.

Joint Services Small Arms Symposium, Exhibition and Firing Demonstration

Virginia Beach Convention Center ◆ May 7-10, 2007
Event #7610

National Defense Industrial Association
2111 Wilson Boulevard, Suite 400
Arlington, VA 22201-3061
(703) 522-1820 • (703) 522-1885 fax
www.ndia.org

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Prefix
(e.g. RADM, COL, Mr., Ms., Dr., etc.)

Name First_____ MI _____ Last_____

Military Affiliation_____ Nickname_____
(e.g. USMC, USA (Ret.) etc.) *(for Meeting Badges)*

Title_____

Organization_____

Street Address_____

Address *(Suite, PO Box, Mail Stop, Building, etc.)*_____

City_____ State_____ Zip_____ Country_____

Phone_____ ext._____ Fax_____

E-Mail_____

Signature*_____ Date_____

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By completing the following, you help us understand who is attending our meetings.

Primary Occupational Classification. *Check ONE.*

- ☐ A. Defense Business/Industry
- ☐ B. R&D/Laboratories
- ☐ C. Army
- ☐ D. Navy
- ☐ E. Air Force
- ☐ F. Marine Corps
- ☐ G. Coast Guard
- ☐ H. DOD/MOD Civilian
- ☐ I. Gov't Civilian (Non-DOD/MOD)
- ☐ J. Trade/Professional Assn.
- ☐ K. Educator/Academia
- ☐ L. Professional Services
- ☐ M. Non-Defense Business
- ☐ N. Other _____

Current Job/Title/Position. *Check ONE.*

- ☐ A. Senior Executive
- ☐ B. Executive
- ☐ C. Manager
- ☐ D. Engineer/Scientist
- ☐ E. Professor/Instructor/Librarian
- ☐ F. Ambassador/Attaché
- ☐ G. Legislator/Legislative Aide
- ☐ H. General/Admiral
- ☐ I. Colonel/Navy Captain
- ☐ J. Lieutenant Colonel/ Commander/Major/ Lieutenant Commander
- ☐ K. Captain/Lieutenant/Ensign
- ☐ L. Enlisted Military
- ☐ O. Other

Year of birth _____
(Optional) _____

Registration Fees

	Early	Regular	Late/ On-Site
	before 3/26/07	3/26/07-4/23/07	after 4/23/07
Government/Academia[1]	❑$625	❑$690	❑$760
Industry/NDIA Member	❑$725	❑$795	❑$875
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☐ I will be attending the Firing Demonstration.

Cancellations received before 3/26/07 will receive a full refund. Cancellations received between 3/26/07 - 4/23/07 will receive a refund minus a $75 cancellation fee. No refunds for cancellations received after 4/23/07.

Substitutions Welcome in Lieu of Cancellations.

[1] Includes a free three-year NDIA membership and *National Defense* magazine for Military and Government employees (first time members only).

☐ No do not sign me up for the membership.

[2] Registration fees for non-NDIA members include a one-year non-refundable NDIA membership—$15.00 will be applied for your subscription to

Payment Options

- ☐ Check *(payable to NDIA - Event 7610)*
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Questions? Contact Carissa Mirasol, Meeting Planner
(703) 247-2588 email: cmirasol@ndia.org
Mail to: NDIA, Event #7610
2111 Wilson Boulevard, Suite 400
Arlington, VA 22201
Fax to: (703) 522-1885

NATIONAL DEFENSE INDUSTRIAL ASSOCIATION
STRENGTH THROUGH INDUSTRY & TECHNOLOGY
2111 Wilson Blvd., Suite 400
Arlington, VA 22201
p (703) 522-1820
f (703) 522-1885

Program Agenda

Monday, May 7, 2007

9:00 AM-4:00 PM	**Registration and Exhibits Set-Up**
5:00 PM-6:30 PM	**Opening Reception in the Exhibit Hall**

Tuesday, May 8, 2007

7:00 AM	**Registration and Continental Breakfast**
7:55 AM	**Welcome and Administrative Announcements** *Mr. Sam Campagna, Director, Operations, NDIA* *Mr. Brian Berger, Chairman, Small Arms Committee, Vice President Business Development, General Dynamics OTS Simunition Operations*
8:05 AM	**National Anthem -** *Miss Kera O'Bryon*
8:10 AM	**Welcome Address** *Representative from US Congresswoman Thelma Drake's Office*
8:20 AM	**Keynote Address** *Mr. George Solhan, Office of Naval Research*
8:40 AM	**Joint Service Small Arms Synchronization Team (JSSAST)** *- COL Scott Crizer, USA, Chairman, JSSAST, Commander Armament Systems Integration Center, US Army ARDEC, Picatinny Arsenal* *- COL Robert Radcliffe, USA, Army Member* *- CAPT Rick Ruehlin, USN, Navy Member* *- Col Charles Beck, USAF, Air Force Member* *- LtCol Tracy Tafolla, USMC, Marine Corps Member* *- CDR Jim Olive, USCG, Coast Guard Member* *- COL Kevin Noonan, USA, SOCOM Member* *- COL Carl Lipsit, USA, PM Soldier Weapons Associate Member* *- Mr. Kevin Swenson, Joint Non-Lethal Weapons Directorate Member*
10:00 AM	**Morning Refreshment Break in the Exhibit Hall**
10:30 AM	**Small Arms Section Awards 2007** *Chinn Award* *Recipient: Mr. Bill Dittrich* *Presenter: Mr. Brian Berger* *Hathcock Award* *Recipient: American Sniper Organization* *Presenter: Mr. William "Bart" Bartholomew and Mr. Russ Logan* *NDIA Professional Service Awards* *Recipient: COL Mark Rider, USA* *Presenter: Mr. William Sanville* *Recipient: COL Scott Crizer, USA* *Presenter: Mr. Joel Goldman* *Recipient: Mr. Richard Audette* *Presenter: Mr. Brian Berger*
11:40 AM-1:10 PM	**Luncheon**
	(12:40 PM) Luncheon Speaker **Hiram Maxim and His Machinegun: A Great Force Harnessed to a Useful Purpose** *CANCELLED*

Tuesday, May 8, 2007
(Continued)

1:10 PM	**Soldier Weapons - PANEL** *Chair: COL Carl Lipsit, USA, PM Soldier Weapons* *Panel: Mr. Richard Audette, Deputy PM Soldier Weapons* *LTC Timothy Chyma, USA, PM Individual Weapons* *Ms. Barbara Muldowney, PM Soldier Weapons* *Mr. Michael Friedman, PM Soldier Weapons*
2:10 PM	Session I - Individual Weapons & Supporting Equipment **Session Chairman: Mr. George Kontis, Vice President of R&D, Knights Armament Company** **Requirements to Current & Future Small Arms** *Mr. Wolfgang Bantle, Heckler & Koch*
2:30 PM	**USSOCOM Small Arms Accessories - SOPMOD** *Mr. Gus Taylor, Naval Surface Warfare Center, Crane Division* *Mr. Jason Davis, Naval Surface Warfare Center, Crane Division*
3:00 PM	**USSOCOM Miniature Day/Night Sight Developments** *Mr Barry Gatewood, Naval Surface Warfare Center, Crane Division* *Mr. Mike Jones, Naval Surface Warfare Center, Crane Division* *Mr. Rick Tousignant, Naval Surface Warfare Center, Crane Division*
3:30 PM	**Afternoon Refreshment Break in the Exhibit Hall**
4:00 PM	Session I - Individual Weapons & Supporting Equipment **(Continued)** **Business Opportunities Within the SOF Weapons Program** *Mr. Troy Smith, Naval Surface Warfare Center, Crane Division*
4:20 PM	Session II - Small Arms Ammunition & Technology **Session Chairman: Mr. Jim Taylor, ATK LCAAP** *338 Lapua - Mr. Bruce Webb* *Mr. Bruce Webb* **Lightweight Small Caliber Ammunition** *Mr. Lucian Sadowski, US Army ARDEC* *Mr. Mark Leng, Armament Engineering & Technology Center*
5:00 PM	**Baselining of the 40mm Family of Ammunition** *Mr. James Grassi and US Army ARDEC*
5:20 PM	**P4rimer: A Red Phosphorus Fueled, Non-Toxic, Heavy Metal-Free Primer for Small Arms Cartridges** *Mr. Randall Busky, ATK Lake City Ammunition Division*

Program Agenda
Wednesday, May 9, 2007

7:00 AM	**Registration and Continental Breakfast**
7:45 AM	**Administrative Announcements** *Mr. Sam Campagna, Director, Operations, NDIA* *Mr. Brian Berger, Chairman, Small Arms Committee, Vice President Business Development, General Dynamics OTS Simunition Operations*
7:50 AM	**Keynote Address** *BrigGen James B. Laster, USMC, Commanding General Training Command, Quantico*
8:20 AM	Session III - Joint Service Small Arms Program Update **Session Chairman: Mr. Joel Goldman, JSSAP, ARDEC** **Lightweight Small Arms Technologies Update** *Ms. Kori Spiegel, US Army ARDEC*
8:50 AM	**Thermal Management for Automatic Firearms** *Mr. George Kontis, Knights Armament Company*
9:10 AM	**NSAC - The Next Step** *Mr. Joel Goldman, JSSAP, US Army ARDEC* *Mr. Jean-Louis Vanderstraetan, CEO, FNMI* *Mr. Darold Griffin, EME,Inc.*
9:30 AM	**Joint Services Small Arms Technology Plan** *Mr. John Edwards, US Army ARDEC, JSSAP Office*
9:50 AM	**Morning Refreshment Break in the Exhibit Hall**
10:10 AM	**Industry Perspective - PANEL** *Chair: Mr. Dave Broden, Chairman, Armaments Division, NDIA* *Panel: FN Manufacturing, Colt Defense, Smith Wesson, Knights Armament* *Heckler & Koch (Invited)*
11:00 AM	Session IV - NATO **Session Chairman: Mr. Vernon Shisler, US Army ARDEC, JSSAP Office** **NATO Soldier System Capabilities** *Mr. Vernon Shisler, US Army ARDEC, JSSAP Office*
11:20 AM	**NATO Small Arms Ammunition Interchangability via Direct Evidence Testing** *Mr. Lascelles (Sandy) Geddes, III, US Army ARDEC*
11:40 AM	**Dismounted Infantry Weapon Activities in NATO** *Mr. Mark Richter, Marine Corps Systems Command*
12:00 - 1:30 PM	**Luncheon**
	(1:00 PM) Luncheon Speaker **M14 to MK 14 - Evolution of a Battle Rifle** *Mr. David Armstrong, Naval Systems Warfare Center, Crane Division*

Wednesday, May 9, 2007 (Continued)

1:30 PM	**Session IV - NATO** **(Continued)** **Non-Lethal Activites in NATO** *MAJ Kevin Finch, US Army Infantry School, Fort Benning*
1:50 PM	**NATO Military Operations in Urban Terrain** *Mr. Vernon Shisler & LtCol Eric de Saint-Salvy, NATO AC/225 TG/3*
2:10 PM	**"What You Can do For Them Today, What You Can do For Them Tomorrow"** *LTC Keith Cook, UK Army (Ret), MBE, System Design Evaluation, Ltd.*
2:30 PM	**Session V: Crew Served Infantry Weapons & Equipment** **Session Chairperson: Ms. Candice Campbell, General Dynamics Armament & Technical Products** **Future Combat System (FCS) Close Combat Armament System (CCAS) Weapon Alternatives - Performance Assessment** *Mr. Andrew Clark, US AMSAA* *Mr. Dean Muscietta, US AMSAA*
2:50 PM	**XM307 ACSW Dual Feeder and Receiver Design Rough Handling** *Mr. Brian Hatin, General Dynamics Armament & Technical Products*
3:10 PM	**Afternoon Refreshment Break in the Exhibit Hall**
3:40 PM	**Session V: Crew Served Infantry Weapons & Equipment** **(Continued)** **Nammo's Solution for Urban Operations** *Mr. Jarl Eirik Straume, Nammo Raufoss AS*
4:00 PM	**Heavy Machinegun Fire Control as a Distributed Operations Enabler** *Mr. Joseph Brus, Naval Surface Warfare Center, Crane Division*
4:20 PM	**Session VI : Modeling & Simulation** **Session Chairperson: Ms. Liliana McShea, US Army ARDEC** **Small Arms & Dismounted Infantry Modeling With the Infantry Warrior Simulation (WARS)** *Ms. Alicia Borgman, General Dynamics Information Technology*
4:40 PM	**Modeling & Evaluation of the Human Torso Model** *Dr. Jack Roberts, John Hopkins University, Applied Physics Laboratory* *Mr. Andrew Merkle, John Hopkins University, Applied Physics Laboratory*
5:00 PM	**Mechanical System Simulation of the XM 307 Crew Served Weapon** *Ms. Callista Rodriguez, General Dynamics Armament & Technical Products*
5:20 PM	**Transforming Small Arms Maintenance Training Through Virtual Task Trainers** *Mr. Troy Welch, NGRAIN Corporation*
5:40 PM	Conference Adjourns for the Day

Program Agenda
Thursday, May 10, 2007

7:00 AM	**Registration and Continental Breakfast**
7:45 AM	**Administrative Announcements** *Mr. Sam Campagna, Director, Operations, NDIA* *Mr. Brian Berger, Chairman, Small Arms Committee, Vice President Business Development, General Dynamics OTS Simunition Operations*
8:00 AM	**NDIA Armament Division Status Overview** *Mr. Dave Broden, Chairman, Armaments Division, NDIA* *HQ TRADOC*
8:20 AM	Session VII: PM Maneuver Ammunition System **Session Chairman: COL Mark Rider, USA, PM Maneuver Systems** **LTC Eric Fletcher, USA, PM Small & Medium Caliber**
9:20 AM	Session VIII: Less Than Lethal Systems & Technology **Session Chairman: Mr. Kevin Swenson, JNLWD, Quantico**
9:40 AM	**40 mm Less Lethal Munitions** *Mr. Keith Olasin, Mechanical Solutions, Inc.* *Mr. Paul Boyadjis, Mechanical Solutions, Inc.*
10:00 AM	**Airburst Non-Lethal Munition** *Mr. Nicholas Grossman, US Army ARDEC*
10:20 AM	**Joint Harmonization of Testing Non-Lethal Munitions** *Ms. Liliana McShea, US Army ARDEC*
10:40 AM	**Small Arms Fire Control - PANEL** *Chair: Mr. John Edwards, JSSAP, ARDEC*
11:00 AM	Closing Remarks (Adjourn to Buses for Lunch and Firing Demonstration at Blackwater Training Complex)
4:30 PM	Buses Return to Conference Center - Conference Adjourns

See you next year at the

Joint Services Small Arms Systems Annual Symposium, Exhibition, & Firing Demonstration

May 12-15, 2008

Atlantic City, NJ

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Sincerely,
Jason Simione
President of Bulldog Military Equipment

Thank You to our Firing Demonstration Promotional Partner...

GENERAL DYNAMICS
Ordnance and Tactical Systems

M14 to MK 14
Evolution of a Battle Rifle



Dave Armstrong (ISEA - Sniper Weapons), NSWC Crane, Code 4081

Distribution Statement A - Approved for public release; distribution unlimited.

The M14's Difficult Starting Point





- M14 – slated to replace all shoulder arms to be complemented by M60 MG



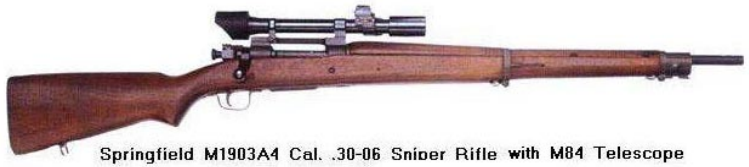
M1 Garand – "Greatest battle implement ever devised" Gen. Patton



M1D Cal. .30-06 Sniper Rifle with M84 Telescope



M3 "Grease Gun"



Springfield M1903A4 Cal. .30-06 Sniper Rifle with M84 Telescope



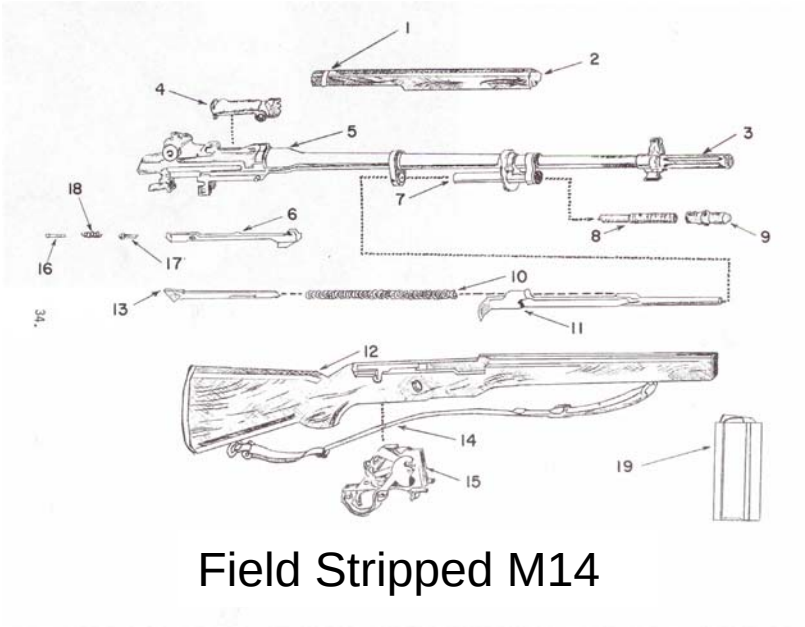
M1 / M2 Carbine



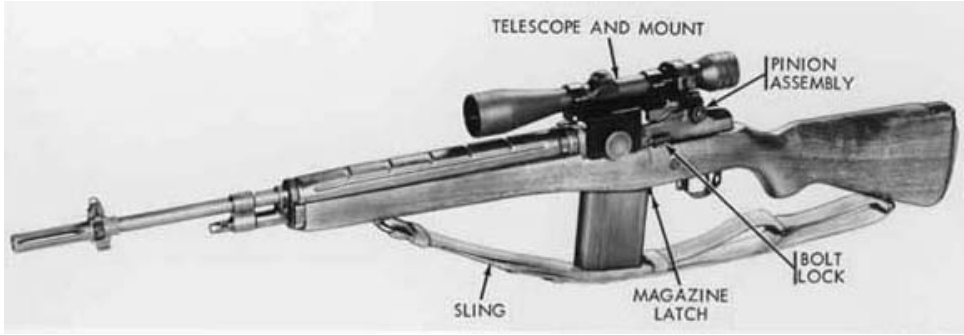
Browning Automatic Rifle (BAR – M1918A2)

Distribution Statement A - Approved for public release; distribution unlimited.

Specialty M14 Configurations



Field Stripped M14





M21 Sniper Rifle



M14A1 (aka E2)

Distribution Statement A - Approved for public release; distribution unlimited.

Gene Stoner's Aircraft Alloy AR-15



M16A1

6.6 lbs – 20.5" barrel



XM177E2

6.2 lbs – 11.5" barrel

The M14's "Competition" from Colt at the time – really filling a different role



German FG42 - 10 lbs
Paratroop Rifle in 8X57mm

Assault Rifle vs. Battle Rifle



M14 Battle Rifle

9.7 lbs

AK-47 Assault Rifle

10 lbs

All weights – with empty mag.

Distribution Statement A - Approved for public release; distribution unlimited.

Evolution Toward the Assault

M1 Carbine
5.5 lbs



MP-43 /44 Stg 44
uses 30 round magazine - 12 lbs loaded



The “Leap” to a true 300 yard/meter capable Assault Rifle / Sturmgewehr





.30 Carbine
7.62X25 and
7.92X33 Kurtz

PPSh-41 with 71 round Drum - 12 lbs loaded

Distribution Statement A - Approved for public release; distribution unlimited.

The Details of Winning Battles

- Inflict casualties in larger numbers than the enemy.
- Inflict casualties at a greater range than the enemy and thus take fewer casualties.
- Inflict casualties at a greater rate than the enemy can tolerate - overcoming training, discipline, and morale, to dominate the field of battle.
- The Germans began demonstrating some of these in WWI
- By the End of WWII the world had a solid respect for the effects of pure volume of fire – firepower.
- Russia quickly produced the SKS and AK-47 chambering the intermediate 7.62X39mm Cartridge to support the new fire and maneuver storm troop tactics the Germans had demonstrated.
- Rate of Fire had become a primary measure of effect in battle.
- The primary combat arm would need only a 300 meter range.

Distribution Statement A - Approved for public release; distribution unlimited.

Early 1960's



M79 Grenade Launcher – began use in 1961 beginning to replace M14 in that role





ARPA (now DARPA) Tests AR-15 against M2 Carbine for use by South Vietnamese Troops

Results of this testing and use of the 1000 AR-15s procured by DARPA lead to the thought that the AR-15 would also be ideal for US Troops.



1984 Exercise – M21 and M16A1 w/M203 Grenade Launcher
M203s are first issued in early 1970s

The M203 Rifle Mounted GL evolves out of SPIW concepts

Distribution Statement A - Approved for public release; distribution unlimited.

THE SPIW – Undone by Specifications

Special Purpose Infantry Weapon Efforts

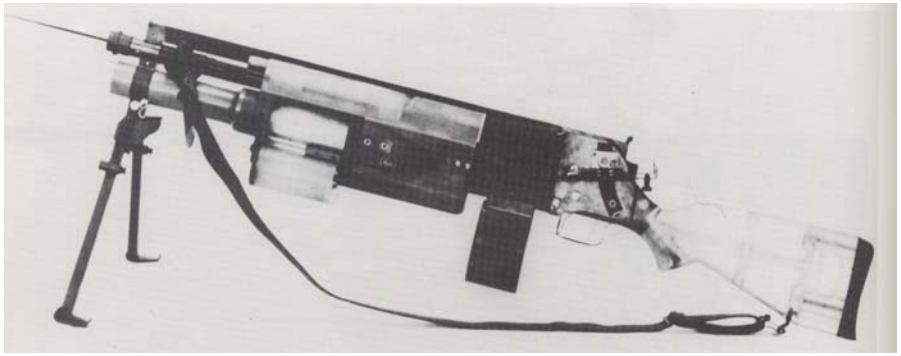
Springfield Armory First Generation SPIW - 14.5 lbs





Olin / Winchester SPIW

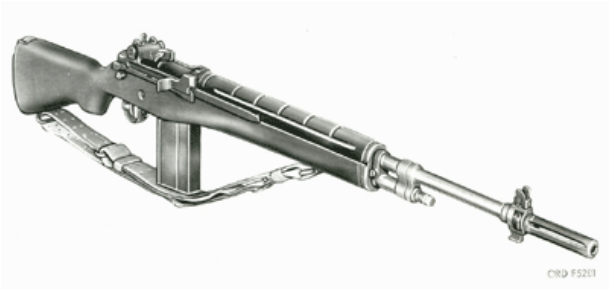
H & R SPIW - 23.9 lbs
Fired 3 Flechettes per shot

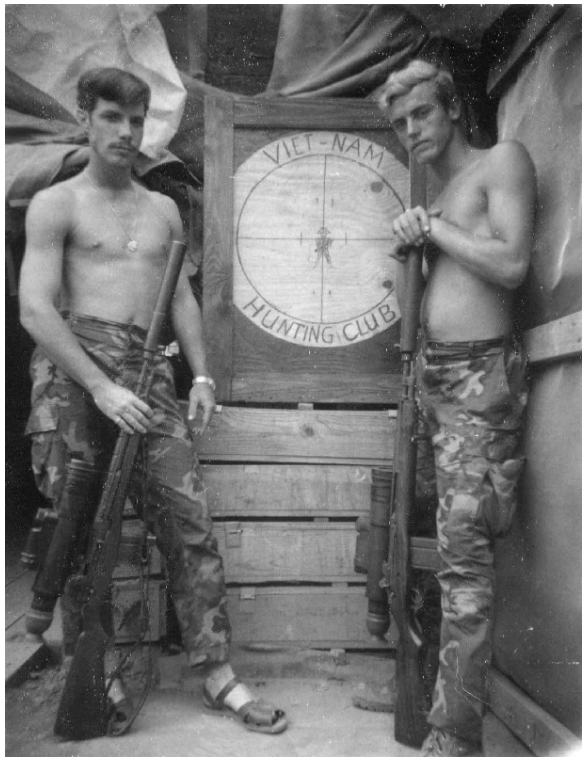


Distribution Statement A - Approved for public release; distribution unlimited.

Vietnam M14 / M21 Use







AN/PVS-2 and M14SS-1 Suppressors



Fixed Bayonet

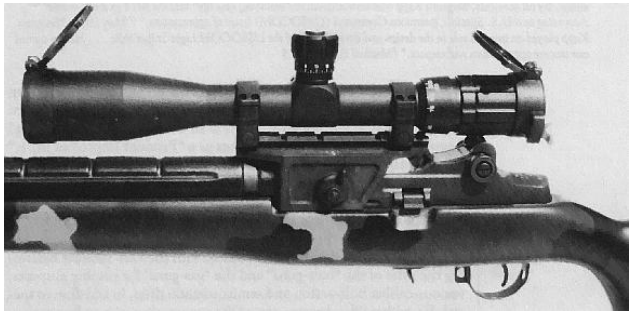


Vietnam Sniper

Distribution Statement A - Approved for public release; distribution unlimited.

Sniper Rifle Updates





Navy M14 Port Security (double lugged) and Match Rifles (single lug)



USMC DMR with AN/PVS-10 Day / Night Sight and OPS Supp.



Army XM25 / M25 (also used suppressed)





M24 – Army Commercial Competition 1988

USMC M40A1 - first M40 was 1966

Distribution Statement A - Approved for public release; distribution unlimited.

Current/ Future 7.62mm Sniper Weapons



Last Navy Sniper M14 – SSR (Sniper Security Rifle)



MK 11 MOD 0 (Navy SR 25)- Suppressed



Army XM110 – w/minor changes M110



SCAR-H MK 17 SSR Sniper Support Rifle (Prototype)

Distribution Statement A - Approved for public release; distribution unlimited.

Recent Navy M14 / MK 14 Use



Navy EOD MK 14 MOD 0 – (representative optic)



SEAL - Advertising Photo

Navy M14 Line Throwing



SEALs with MK 48 LMG & 2 MK 14 MOD 0s



Burial at Sea

Distribution Statement A - Approved for public release; distribution unlimited.

Recent Army M14 Usage



Baghdad Night / Day

7.62mm NATO remains cartridge of choice for certain tasks



Army Sharp Shooters - Mosul, Iraq



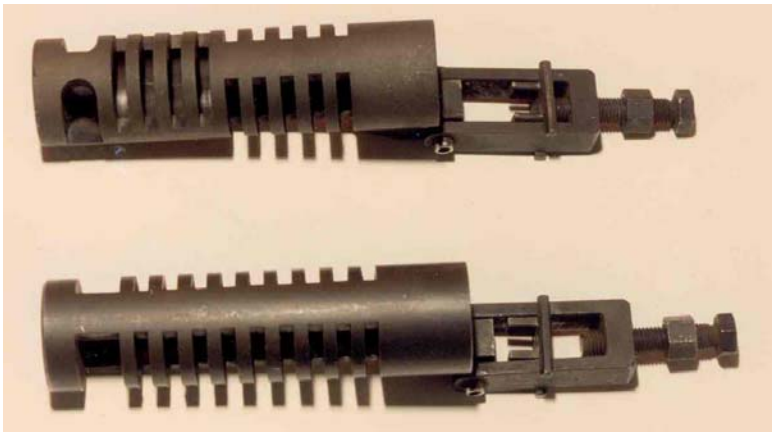


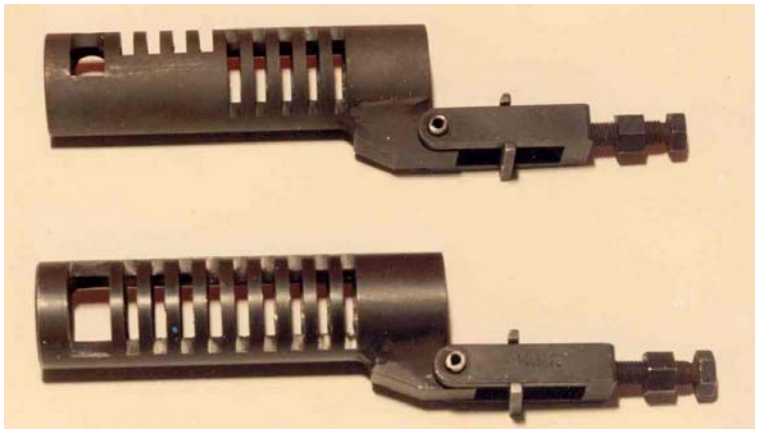
Army M14 in Iraq



Distribution Statement A - Approved for public release; distribution unlimited.

Navy M14 Muzzle Compensator





Navy Optimized M14 Brake/Compensator Top



M14 with Beretta BM59 type folding stock (Top) AKM below

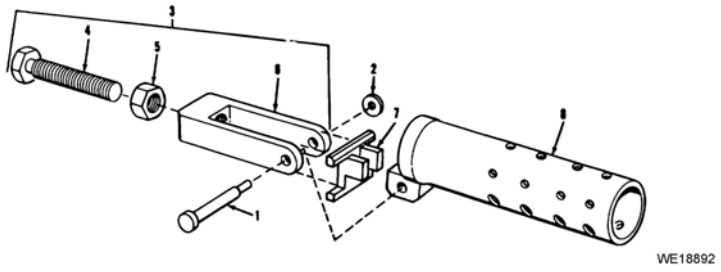


Figure 9. Stabilizer assembly- exploded view.

Original M14A1 Compensator

Distribution Statement A - Approved for public release; distribution unlimited.

Arctic Stock for M14 Starting Point



Example of Sage Arctic Stock Upgrade to GI Fiberglass/Plastic



Top – M14 bipod leg used for telescoping mechansim on A1 wood stock.

Middle – M4 Carbine Type modified GI fiberglass stock.

Bottom – Later Sage Mod (orig. had no cheekrest).

Not Shown – Butler Creek Side Folder Mod.



Arctic Stocked M14 with KAC-RAS

Distribution Statement A - Approved for public release; distribution unlimited.

Original EBR Concept Demonstration



GI fiberglass top / 1st Sage below



Lightening cuts, Paint and
16 inch prototype barrel



LMT rail mounted M203 concept
("ammo bearer" recommended)



Forward mounted AimPoint
and light bipod



Distribution Statement A - Approved for public release; distribution unlimited.

Original Enhanced Battle Rifle Concept

EBR System Features – Starts with Chassis Stock











Distribution Statement A - Approved for public release; distribution unlimited.

M14 EBR Test Configurations







M983 in front - not great / behind 1.5-5X – not bad

Test EBR configured with Light and Reflex Sight





AN/PVS-17 MNVS (2.25X) – Nice (w/PEQ-2)



Pocket Scope (M983) behind AimPoint (or any Reflex sight)



UNS – Universal Night Sight (now AN/PVS-22) – excellent capability

Distribution Statement A - Approved for public release; distribution unlimited.

M14 to MK 14 MOD 0 Changes







- Stock System (Chassis)
- Operating Rod Guide
- Front and Rear Sights
- Gas Cylinder Lock
- Stripper Clip Guide (1913)
- Extended Bolt Release
- 18 inch barrel (vs. 22 inch)
- Improved Flash Suppressor
- Accessories – rings, bipod, grip, sling, case, cleaning kit, tool

Distribution Statement A - Approved for public release; distribution unlimited.

MK 14 MOD 0 and MOD 1



MK 14 MOD 0





MK 14 MOD 1 – First Issued





MK14 MOD 1 – after Suppressor Down Select

Distribution Statement A - Approved for public release; distribution unlimited.

MK 14 MOD 0 vs MOD 1



MK 14 MOD 1 with AV/PVS-26



Special EBR folding Tool



Air Force MK 14 MOD 0 w/ Leupold 3.5-10X



Latest Navy MK 14 MOD 1 (2.5-10X NXS)

Weight comparison: Empty - No Bipod, No Supp, No Mag. Mag. weighs 1/2 pound empty, weight includes forward grip – no optic (or riser on MOD 1).

MOD 0	MOD 1
11.4 lbs	10.6 lbs
Bipod .74 lbs	Bipod 1.04 lbs

MOD 1 Sound Supp. =1.27 lbs

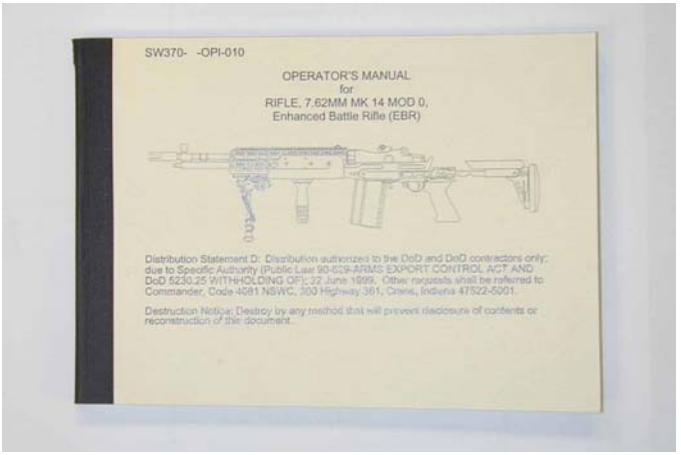
Distribution Statement A - Approved for public release; distribution unlimited.

MK 14 vs M4A1 Length





MK 14 MOD 0 – 1.5-5X Optic Concept
Original M14 is 44.4 inches long



MK 14 MOD 0
Operator's Manual

Top - MK 14 MOD 1: 37.0 inches

Middle - MK 14 MOD 0: 35.0 inches

Bottom - M4A1 Carbine: 30.5 inches

(all weapons with stocks at shortest length)

Distribution Statement A - Approved for public release; distribution unlimited.

M14 EBRs in use







Air Force MK 14 in Transit





Distribution Statement A - Approved for public release; distribution unlimited.

More "Drop In" M14 EBR Conversions













Distribution Statement A - Approved for public release; distribution unlimited.

Other M14 Related Developments



Original Rock – SOPMOD M14 – had reconfigured gas system and metal stock



Latest Troy Industries M14 Stock



JAE 100 - Sniper Type Stock - No bedding required



McMillan MFS-14 System



Smith Enterprise Day / Night Optic Mounts

Distribution Statement A - Approved for public release; distribution unlimited.

NAVSEA WARFARE CENTERS
CRANE

Accessorization





Many SOPMOD Kit Type Accessories are useful on M14 EBRs / MK 14s to Include the Latest Array of Night Vision and Thermal Clip-On Units as well as the various Lasers, Lights and Optical Sights and most anything else mountable to Mil Std 1913 Rails.

Distribution Statement A - Approved for public release; distribution unlimited.

Fighting at 300 meters and Less



FN P90
5.7X28mm



HK MP7
4.6X30mm



MARS – 5.56X30mm



KAC – PDW 6X35mm (8 inch)
(10 inch barrel also available)



SCAR-CQC



5.56X45mm

MK 18 CQC or CQBR on M4

Distribution Statement A - Approved for public release; distribution unlimited.

OPTIMIZATION of Weapon / Ammo Load

Approved for Public Release

Weapon System Weights -
Need to fit within an Ideal 45 lbs (50 lb maximum) fighting load including other Kit

An M203 Grenade Launcher
adds 3 lbs plus 3/4 lb per M433 HEDP round

Cartridge	7.62X51	7.62X39	5.56X45	5.56X45	5.56X30	5.7X28	4.6X30
Weights-lbs	**M14**	**AKM**	**M4A1**	**M4-10"**	**MARS**	**FN P90**	**HK MP7**
Weapon	8.6	8.5	6.6	6.3	5.5	5.6	3.9
Cartridge	0.055	0.047	0.026	0.026	0.022	0.014	0.014
Magazine	0.50	0.70	0.24	0.24	0.19	0.21	0.19
w/210 rnds	**20.7**	**18.7**	**12.2**	**11.9**	**10.3**	**8.6**	**7.0**
w/300 rnds	**25.9**	**23.1**	**14.7**	**14.4**	**12.3**	**9.9**	**8.3**
w/420 rnds	**32.9**	**28.9**	**17.9**	**17.6**	**15.0**	**11.6**	**10.1**
w/510 rnds	**38.1**	**33.3**	**20.3**	**20.0**	**17.1**	**12.9**	**11.4**

Ammunition Load Comparison

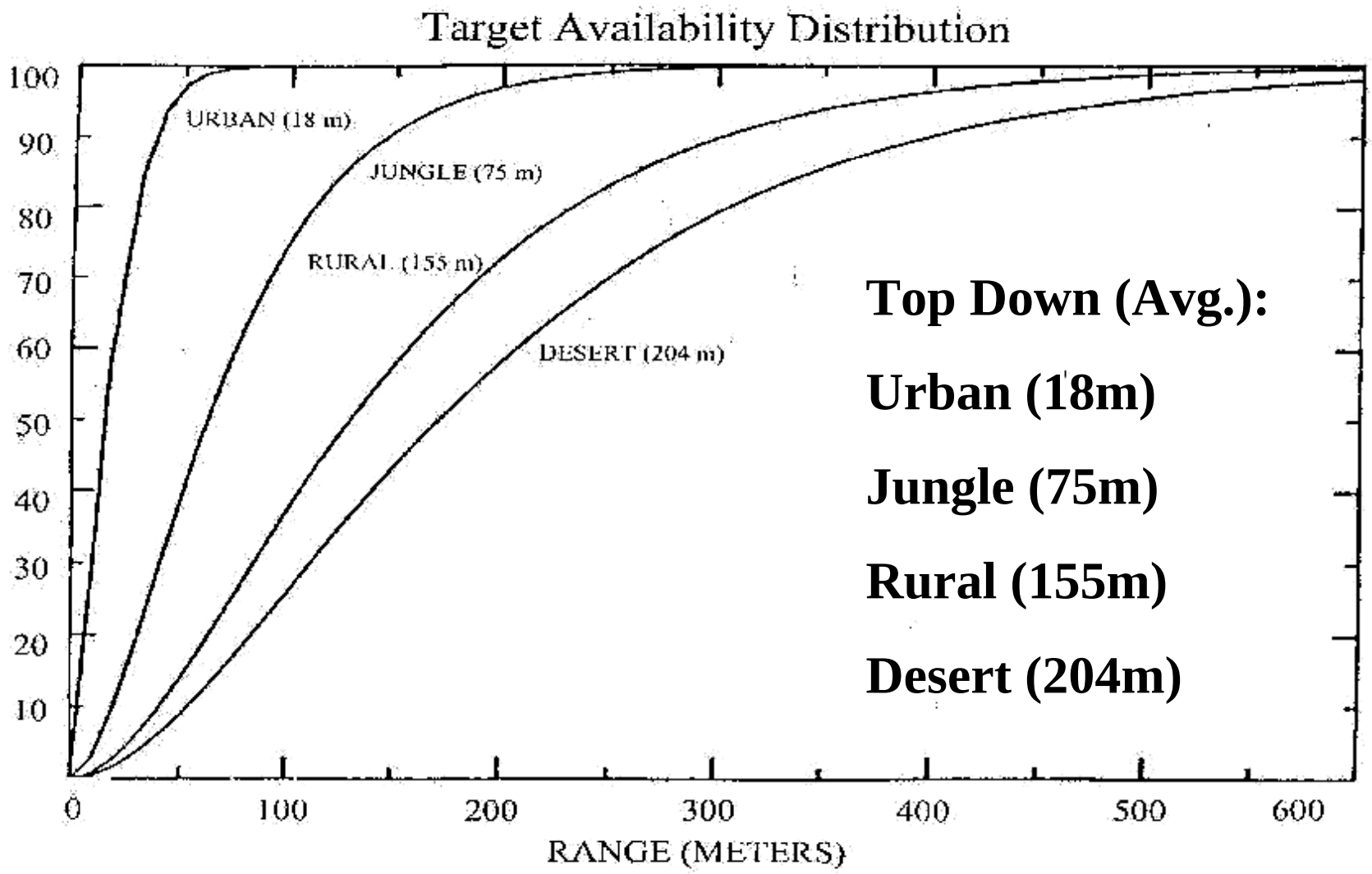
Minutes of Combat at 45 shots per minute
(possible ambush rate of fire)
with a 10 pound ammunition load:
- Magazine weight not considered



Rnds	Cartridge	Time (+/- 6 sec)
182	7.62 NATO	3 minutes
385	5.56/9mm NATO	6 1/2 minutes
210	7.62X39	3 1/2 minutes
455	5.56X30MARS or 6X35KAC (est.)	7 1/2 minutes
714	5.7X28 /4.6X30	>11 minutes

Distribution Statement A - Approved for public release; distribution unlimited.

Expected Target Distribution (OICW Study)



Top Down (Avg.):

Urban (18m)

Jungle (75m)

Rural (155m)

Desert (204m)

public release; distribution unlimited.

M14 to MK 14 – Evolution of a Battle Rifle

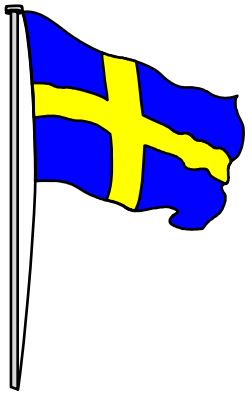




Dave Armstrong
ISEA - Sniper Weapons
Naval Surface Warfare Center
Crane Division, Code 4081

Distribution Statement A - Approved for public release; distribution unlimited.





Swedish Fire Control System Development

Presentation to

”NDIA Small Arms Systems Symposium”

May 10, 2007

Per G. Arvidsson

Product Manager Small Arms Systems

Försvarets Materielverk (Swedish Defence Materiel Administration)

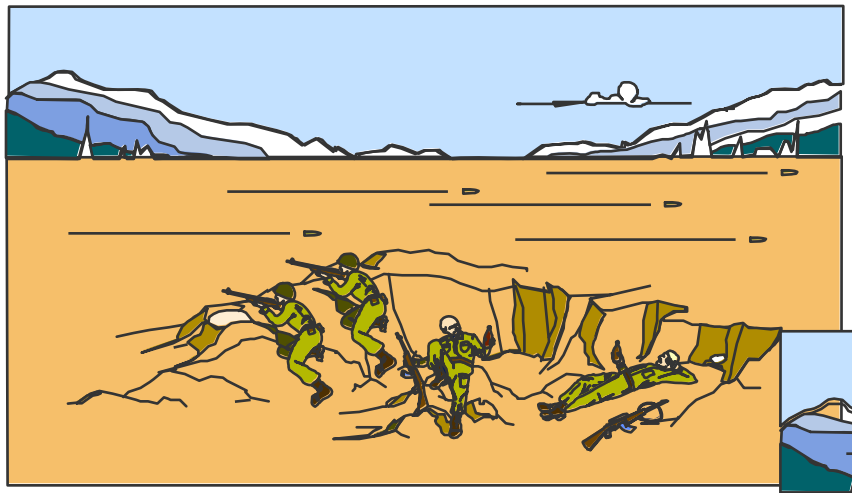
Tel: +46-8-782 4181, Fax: +46-8-782 6412

E-mail: per.arvidsson@fmv.se

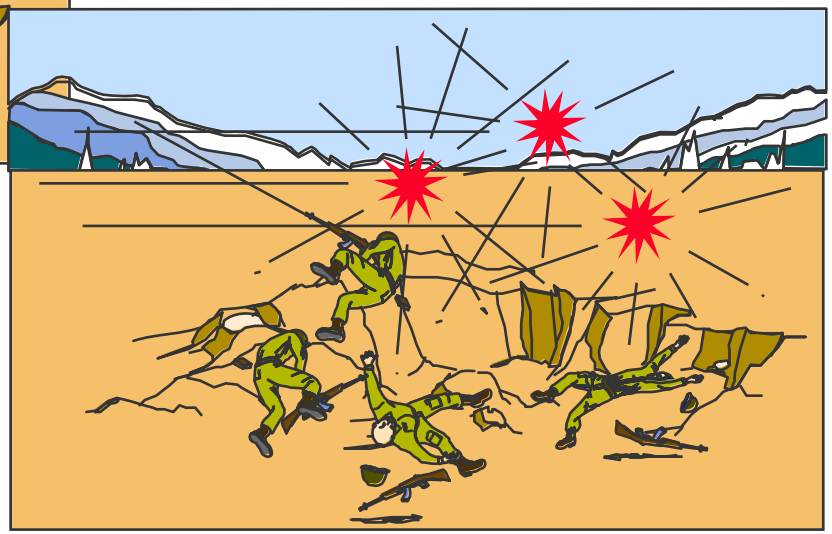
Web-site: www.fmv.se

FMV

There is no hiding from programmable ammo !



KE ammo can only ***suppress*** personnel in defilade!



Programmable ammo ***kills***!

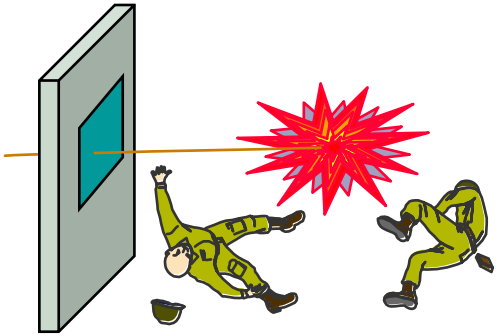
Air burst is only *one* of the modes



Air Burst



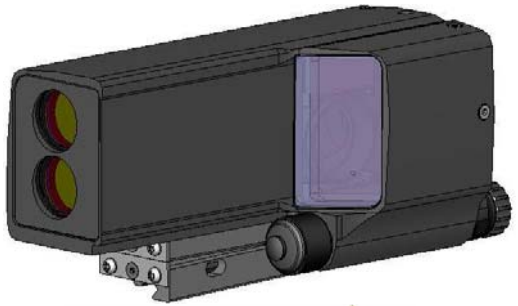
Point Detonating



Point Detonating Delay

Swedish FCS development

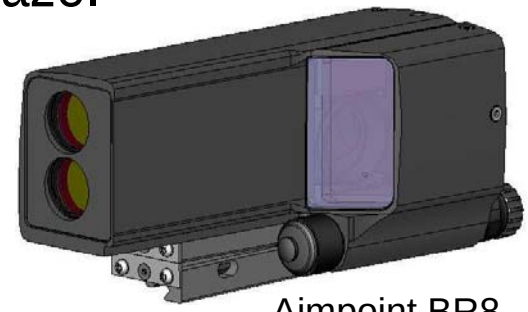
- Trials with AGL's with different FCS's, and a market study have shown that currently there is no simple, lightweight, robust and affordable FCS available.
- Sweden has therefore decided to develop a FCS with industry for use with underslung grenade launchers, AGL's and 84mm Carl Gustaf recoilless rifles.
- A PDF study was done in 2002.
- A development contract was placed with Aimpoint in 2005.
- Delivery of prototypes in August -07.



FMV

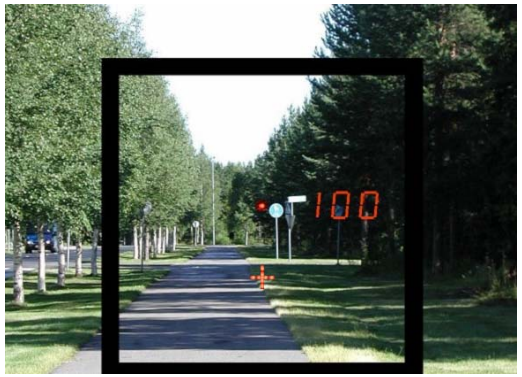
Requirements for Swedish FCS

- Red dot for aiming and laze.
- Moving cross.
- No magnification.
- No moving parts.
- Large field of view (20°)
- Easy to use and fast.
- High contrast in display.
- All information in display.
- Accurate when ranging.
- Small and light (less than one kg).
- NVD compatible.
- Capability to program ammunition.
- MIL-STD 1913 rail (“Picatinny rail”).
- “Long” battery life (more than one week).
- Realistic price.



Aimpoint BR8





FMV

How it works





1. Aim and measure range





2. Realign and shoot

The Soldier: America's Most Deployed Combat System

Project Manager Soldier Weapons Overview

For the

Small Arms Symposium & Exhibition

National Defense Industrial Association

7-10 May 2007

BG R. Mark Brown
Program Executive Officer Soldier

Mr. Richard Audette
Deputy PM Soldier Weapons

Program Executive Office Soldier

As of 11 APR 2007

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- PM Crew Served Weapons

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- PM Land Warrior

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- PM Clothing & Equipment
- PM Sensor & Lasers
- PM Soldier Survivability

Director Rapid Fielding Initiative
COL Bonheim
(703) 704-3776

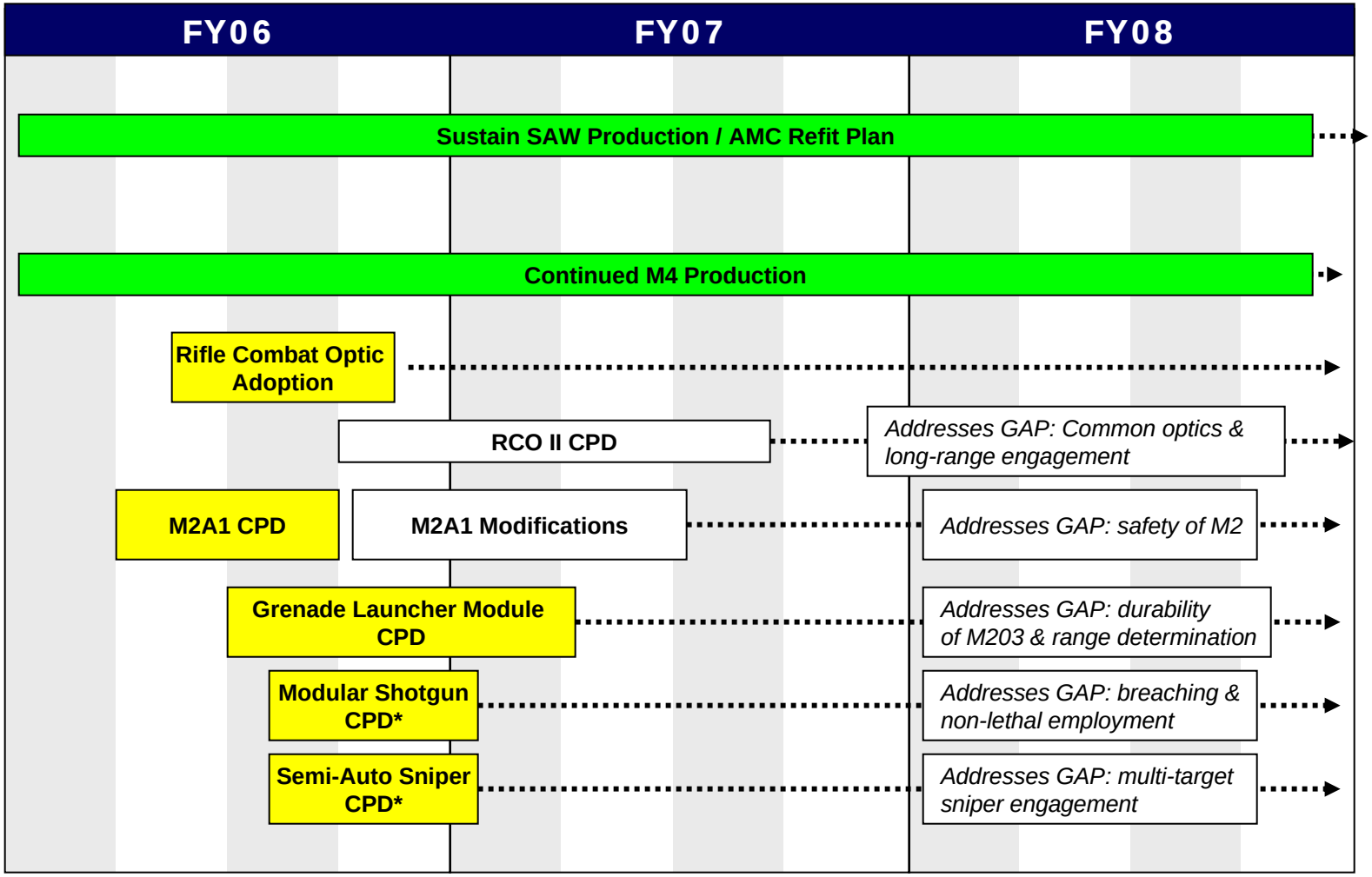
DD Rapid Fielding Initiative
Sam Parrish
(703) 704-2118

- Operations
- Logistics
- Fielding
  - CONUS
  - Iraq
  - Afghanistan

Soldier Weapons Mission

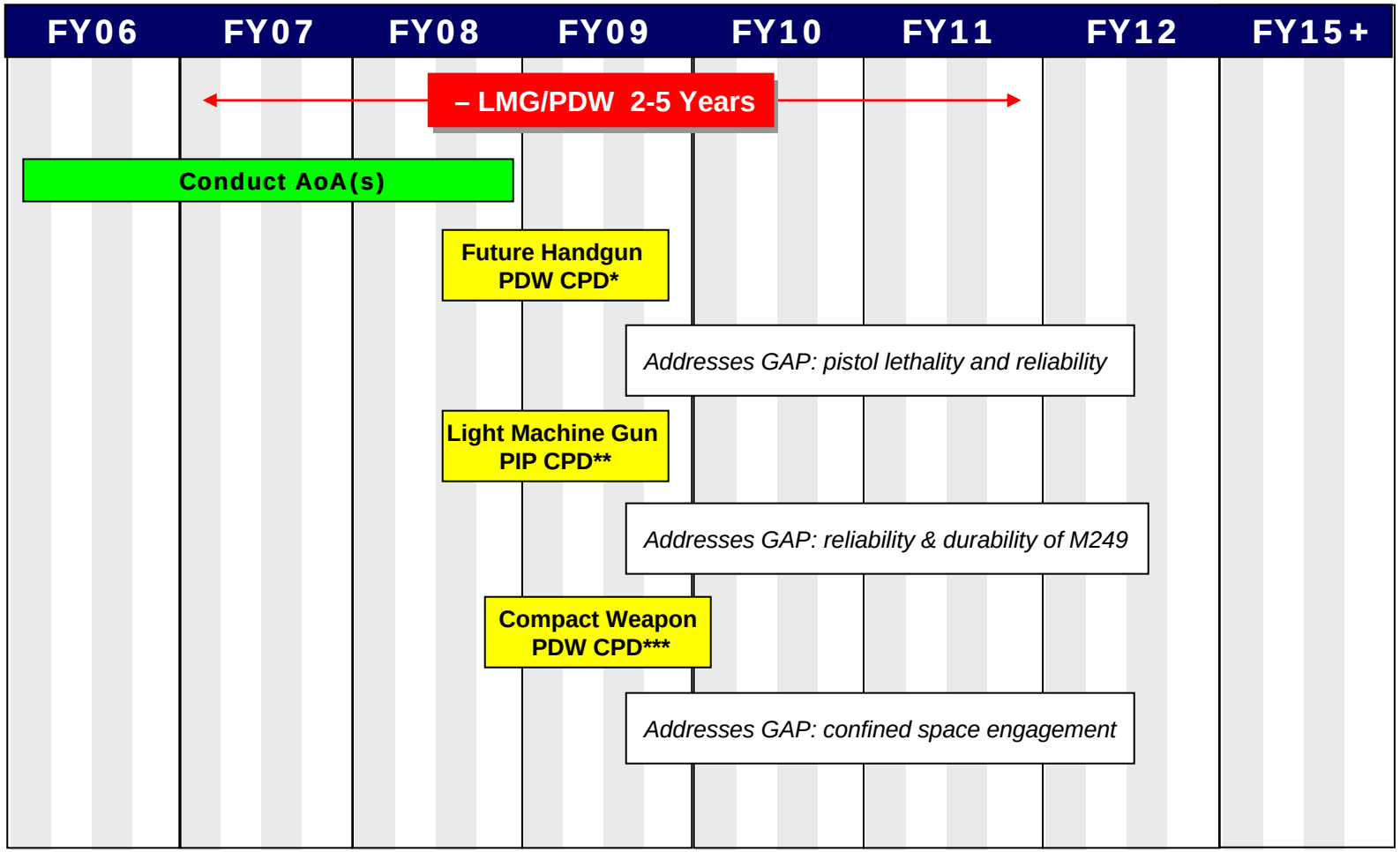


Near-Term Strategy Implementation



Sustains Current Force And Addresses Some Gaps Through PIP/COTS Solutions

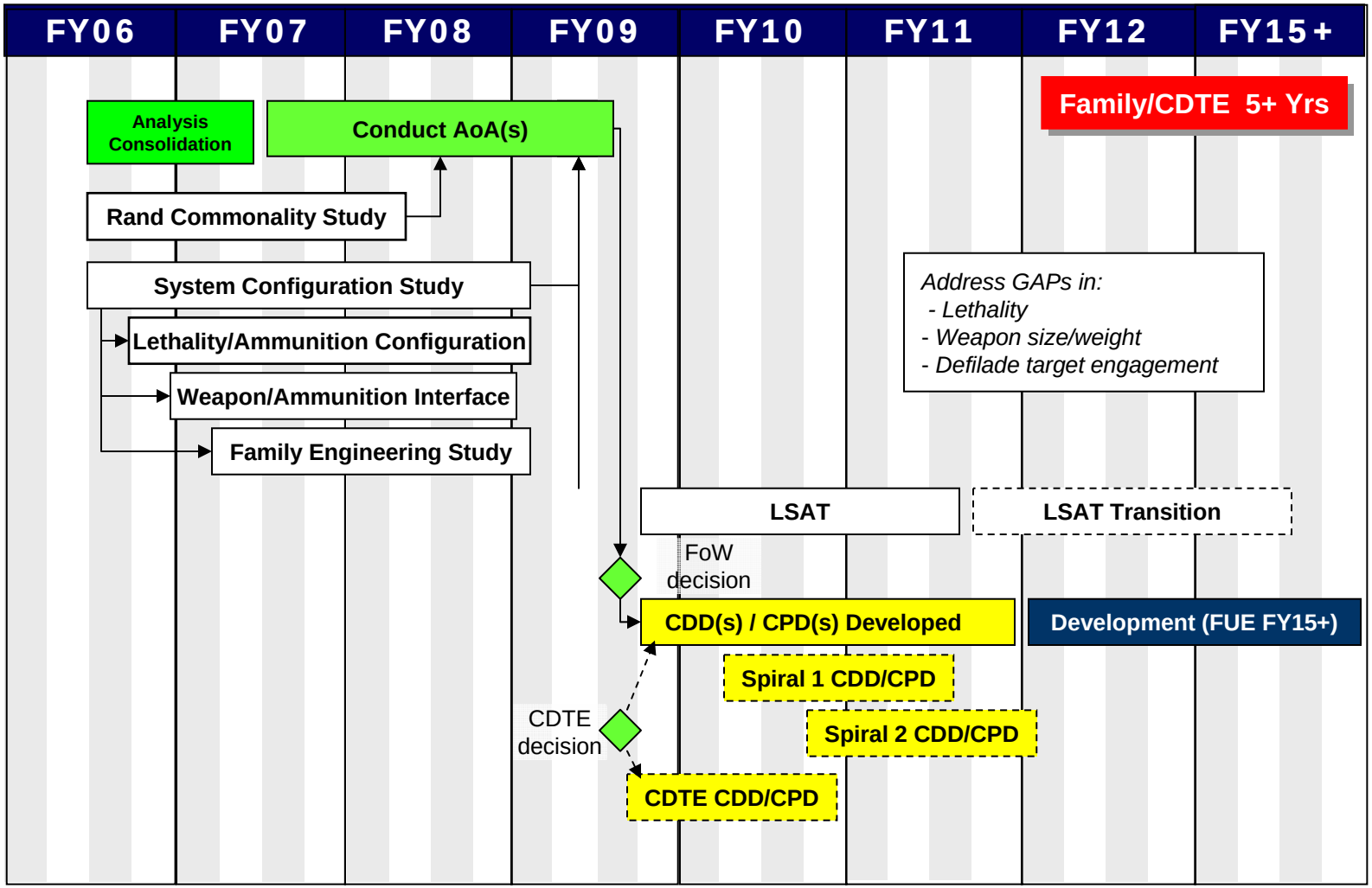
Mid-Term Strategy Implementation



* Pending outcome of SOCOM Combat Pistol Staffing
Source document: SaaS ICD, GSS CDD (PDW Attribute)
** Source document: SaaS ICD, GSS CDD, SAW JSOR
*** AoA to determine configuration.
Source document: SaaS ICD, GSS CDD (PDW attribute)

Addresses Key Current Force Gaps With Specific Solutions

Far-Term Strategy Implementation



Develops More Lethal And Effective Future Systems Based On Appropriate Analysis And Emerging Advanced Technology

PM Soldier Weapons Programs List

DEVELOPMENT

WEAPONS

1. XM25, Individual High Explosive Air Burst Weapon System Technology Demonstration
2. XM101, Common Remotely Operated Weapon Station (CROWS)
3. Advanced Crew Served Weapon (ACSW) Programs

SOLDIER ENHANCEMENT PROGRAMS

4. XM26, 12 Gauge Modular Accessory Shotgun System (MASS)
5. Future Handgun System
6. Family of Small Arms Suppressors (FoSASS)
7. M68 Close Combat Optics Re-competition
8. XM1116, 12 Gauge Extended Range Non-Lethal Cartridge
9. XM1022, Sniper Ammunition for M107
10. XM110, 7.62 Semi-Automatic Sniper System (SASS)
11. Close Quarters Battle (CQB) Kit
12. XM1041/XM1042/XM1071 - Close Combat Mission Capability Kit (M4/M16/M249/M9/M11)
13. Advanced Sniper Accessory Kit (ASAK)
14. XM320, Grenade Launcher Module (GLM)
15. M2 A12 Quick Change Barrel Kit Program

BLOCK MOD PROGRAMS

16. CROWS-Lightning Remote Weapons Station
17. XM150, Rifle Combat Optic (RCO)
18. M2E2 Machine Gun Lightweight Tripod Program
19. Swing Arm Mount for HMMWVs
20. HMMWV Improved Auxiliary Weapon Mount
21. XM240E6, Medium Machine Gun Weight Reduction Program
22. M249 SAW 200 Round Soft Pack

AMMO BLOCK MOD PROGRAMS

23. XM1037, Short Range Training Round For M4, M16 and M249
24. Lightweight Small Caliber Ammunition
25. Proximity Fuzed Door Breaching Cartridge
26. 40mm Day Night Training Cartridge (FCT)

RFI FY05 ITEMS

- TA31F - 4X ACOG
- Weapon Light
- M24 Small Binoculars
- M122/A1 Tripods
- M249/M240B Spare Barrel Bag
- Three Point Sling
- Improved Spotting Scope With Tripod
- Improved Cleaning Kit
- Improved Buttstock For M4 Carbine
- Forward Grip Bipod
- M203 Day/Night Sight
- Back Up Iron Sight
- M249 Rail
- M240B Rail
- M249 Ammo Soft Pack
- M240B Combat Ammo Pack
- M192 Lightweight Tripod
- M249 Short Barrel
- M249 Collapsible Buttstock
- M4/M5 Modular Weapon System
- M145 Machinegun Optic
- M68 Close Combat Optic

PROCUREMENT

27. M151E1 & M151E2 Protector Remote Wpn System (RWS)
28. MK19, Grenade Machine Gun
29. MK19 MODS
30. Mod Kit
31. Lightweight Adjustable Sight Bracket
32. Tactical Engagement Simulator (TES)
33. M107 Semi Automatic Long Range Sniper Rifle
34. M240B/H/E6, 7.62mm Medium MG
35. M240B MODS
36. M192, Light Weight Ground Mount For MG
37. Improved Bipod
38. M240B Collapsible Buttstock
39. Improved Flash Suppressor
40. Combat Ammunition Pack
41. M240B Short Barrel
42. M240B Improved Buttstock
43. Sling Assembly for the M240B
44. M249, 5.56mm Squad Automatic Weapon
45. M249 MODS
46. M192, Lightweight Ground Mount For MG
47. MG Front Rails
48. Improved Bipod
49. M249 Improved Collapsible Buttstock
50. Short Barrel for the M249
51. Sling Assembly For M249
52. M16A4 5.56mm Rifle
53. M16 Rifle Mods
54. M68 Close Combat Optics (CCO)
55. Close Quarters Battle (CQB) Kit (Production)
56. M4, 5.56mm Carbine
57. M4 Mods
58. M145 Machine Gun Optics
59. M25 Stabilized Binoculars
60. M24 Mini Binocular

AMMO PRODUCTION PROGRAMS*

61. M903/M962 Cal .50 SLAP/SLAPT
62. M1001, 40mm Canister Round
63. M100, Grenade Rifle Entry Munition (GREM)
64. M862 5.56mm Short Range Training Ammunition
65. M1030 12 Gauge Breaching Round
66. M973/M974, 7.62 Short Range Training Ammo
67. M992 IR Illumination Cartridge
68. M281 40mm Target Practice Cartridge

* Programs Managed By PM Soldier Weapons For PEO Ammunition In Accordance With MOA

Soldier Weapons Fieldings (1 August 2002 – 1 May 2007)

893,197 Soldiers in 84 BCTs & 166 EABs Total

Weapon/Item	FY05	FY06	Total Issued 8/02-4/07
M4 Carbine	26592	40070	140259
M16 Series Rifle	15918	25852	62305
M500 Shotgun	1695	4804	13392
M107 Sniper Weapon System	328	492	2042
M249 Machine Gun	3076	5793	18739
M240B Machine Gun	3773	3937	16894
M240H Aviation Machine Gun	777	1532	2683
Mk19 Grenade Machine Gun	137	401	3564
M2 Machine Gun	3553	3687	14183
M9 Pistol	2925	11379	25599
M203 Series Grenade Launcher	877	3292	9506
M14 Rifle	400	1378	5353
M79 Grenade Laundcher	50	18	77
CROWS	28	167	243
Backup Iron Sight	72484	58800	192770
M68 CCO	101370	86509	291236
M9 Magazine	81918	425	163594
M4/M16 Magazine	933279	108858	1620849
3 Point Sling	53855	100831	222414
Weapon Light	28887	26128	81277
TA31F ACOG	5818	4180	17861

Weapon/Item	FY05	FY06	Total Issued 8/02-4/07
M203 Day/Night sight	3176	7905	14641
Modular Weapon System Kit (M4 and M5 ARS's))	9390	13776	28631
M4 Forward Grip Bipod	2224	5150	10005
M4 Improved Buttstock	2084	3836	8900
M4/M16 Improved Cleaning Kit	2703	6607	13316
Multipurpose Tool	67875	0	163594
M192 Lightweight Ground Mount	1207	2855	6259
Improved Spotting Scope	416	773	1325
M24 Small Binoculars	24357	21395	62789
M145 Machine Gun Optic	11082	6553	29005
M249 Rail	10009	5378	26243
M249 Short Barrel	8245	10971	27800
M249/M240B Spare Barrel Bag	6297	9830	26285
M249 Collapsible Buttstock	648	6955	11374
M249 Soft Ammo Pack (100 and 200 Round)	28953	19610	67822
M240B Rail	2347	217	3281
M240B Combat Ammo Pack	3907	4388	12170


"Every Soldier is a Rifleman First"
GEN Schoomaker

U.S. AIR FORCE

AF SECURITY FORCES CENTER

USAF Combat Weapons Program

Colonel Charles Beck
HQ AFSFC/SFX
DSN 945-0101
COMM 210-925-0101
Email: charles.beck@lackland.af.mil

USAF Future Handgun Program

- **Vision**
  - **Procure a new handgun for USAF that meets all combat requirements and provides increased capabilities**
    - **Ensure combat needs of all users addressed**
    - **Capitalize on emerging technology**
    - **Focus on AF operational needs with joint partnerships**
    - **Close capability gaps with current handguns**
- **Goals**
  - **Provide Airmen with a more effective handgun**
    - **Increased permanent wound channel size**
    - **Use readily available military cartridge**
  - **Use commercial/non-developmental solution**
  - **Take advantage of new handgun technologies available from industry**

USAF Future Handgun Program

- **Desired Capabilities and New Technologies**
  - **Optimum lethality on the battlefield or in other operations based on increased diameter of bullet; increased tissue damage with non-expanding fully jacketed bullets**
  - **Enhanced corrosion control; reduced operator maintenance**
  - **More shooter friendly, ergonomic design for average to small hands; increased shootability enhancing shooter accuracy**
  - **Size options (standard, compact, etc.) to accommodate certain missions (aircrew, OSI, Personal Security Officer) in same model**
  - **Modular grip panels/inserts (operator ability to adjust grip size)**
  - **Placement of safety controls on receiver**

USAF Future Handgun Program

- **Quantities needed and acquisition timeline**
  - **AF requirement is ~ 100,000 guns and associated ammo**
  - **Seeking Congressional Funding Approval**
  - **Key milestones/decision points:**
    - **Finalize performance specification**
    - **Approve acquisition strategy**
    - **Release Request for Proposal (RFP) for test articles with options for production**
    - **Execute initial down-select from RFP submissions**
    - **Complete test, final down-select and award production contract**





Small Arms and Dismounted Infantry Modeling with the Infantry Warrior Simulation (IWARS)

Alicia Borgman

General Dynamics Information Technology

NDIA Small Arms Symposium

May 2007

Objectives

- IWARS Overview
- Modeling Approach
  - Equipment
  - Behavior
- IWARS Output and Analysis
- Modeling Challenges

IWARS Overview
What is IWARS?

IWARS is...

- Software Army Technology Objective...
- Constructive, agent-based, force-on-force combat simulation...
- Focused on individual and small-unit dismounted combatants and their equipment...
- Used to assess operational effectiveness across a spectrum of missions, environments and threats.



IWARS Overview
V1.0 Applications

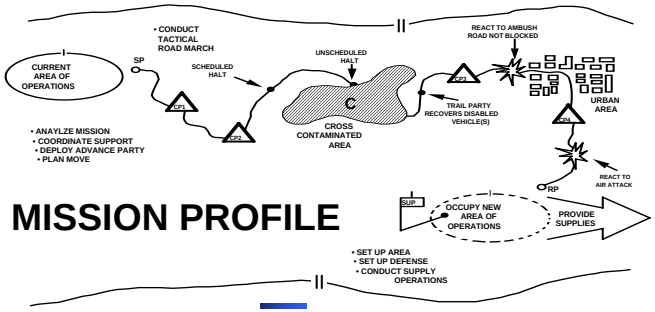
- Through V&V and Sensitivity Analysis, IWARS Version 1.0 found suitable for use in direct-fire, small-unit engagement analyses:
  - Soldier Sensor Performance
  - Soldier Small-arms Lethality
  - Soldier Survivability
  - Situational Awareness / Battle Command (Limited)

IWARS V1.0 approved by the Army's V&V agency for small arms RDA analyses and adopted by Army and international community

Modeling Approach

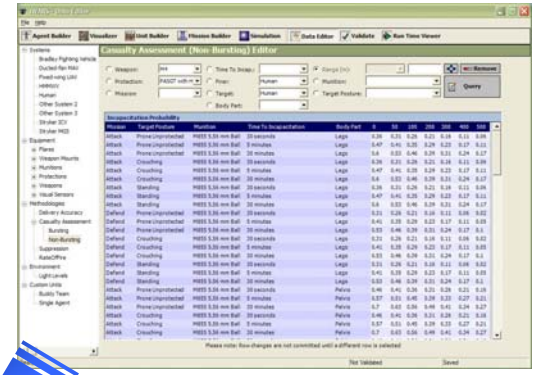
AMSAA
Excellence in Analysis

IWARS
Infantry Warrior Simulation

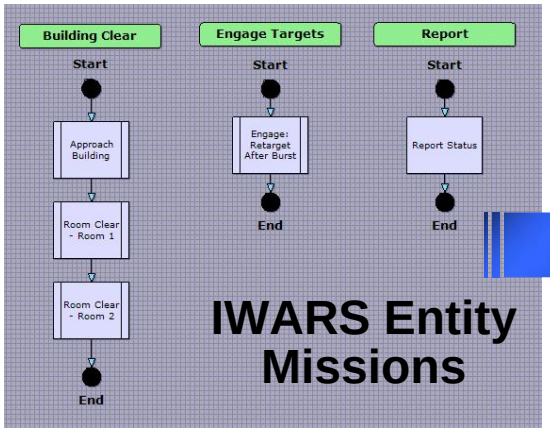


MISSION PROFILE

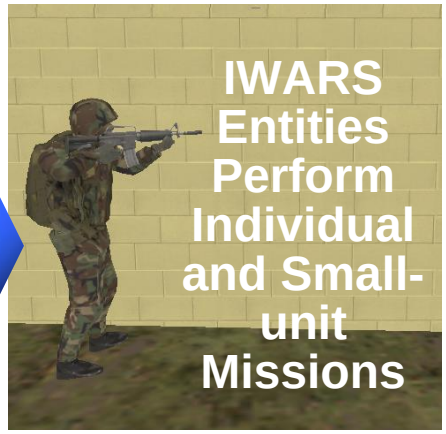
Equipment Performance Data

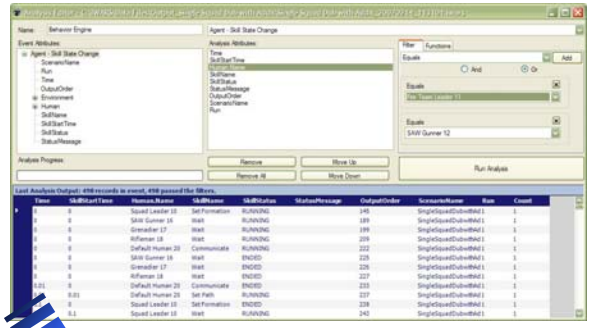


Essential Soldier Tasks



IWARS Entity Missions





MoPs

Operational Effectiveness of Equipment and Tactics

Modeling Approach
Focus

- Ground soldiers and small units
  - User-defined units – not Army-centric
- Equipment
  - Items worn or carried by the Warfighter
  - Platforms for direct interaction with the Warfighter
    - E.g., U-UGS, Stryker ICV
  - Characteristics pertinent to ground soldier missions

Modeling Approach
Focus

- Behaviors
  - Use of Warfighter equipment and employment of tactics
  - Direct Warfighter interactions with other platforms
  - Decisions and actions required at individual and small unit levels

Modeling Approach
Process

1. Identify Soldier capabilities to be evaluated
   - E.g., helmet-mounted fused sensor, NLOS firing capability, information technologies
2. Identify equipment characteristics to model
   - Focus on elements that help or hinder Warfighter's mission

Modeling Approach
Process

3. Research behaviors and processes necessary for Soldier to use capabilities
   - Field manuals, SMEs, use cases, field experiments, existing data
   - Required equipment characteristics include both physical parameters and how the equipment affects the behaviors of the individual and small unit
4. Identify performance data elements and existing methodologies
   - E.g., weapon accuracy, lethality, sensor range, movement speed, completion time

Modeling Approach
Process

5. Create flow chart of behavior process, identifying compound activities, actions (primitives), and conditions (rule sets)
   - Philosophy: as much as possible, use compound activities and keep relatively few primitives – gives user greater flexibility
6. Develop algorithms and code to represent new equipment methodologies, behaviors, and data
   - Algorithms based on performance characteristics, physics, input from SMEs, FMs, and relevant data

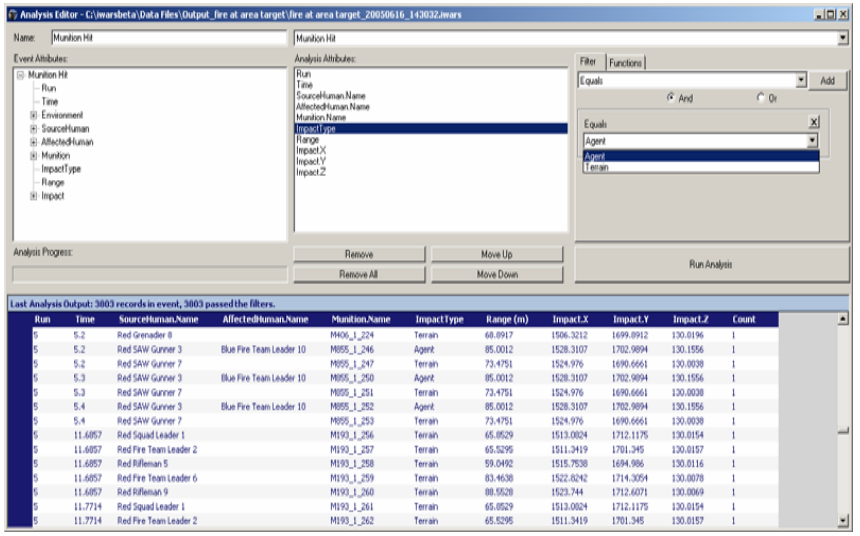
Output and Analysis
Available Outputs

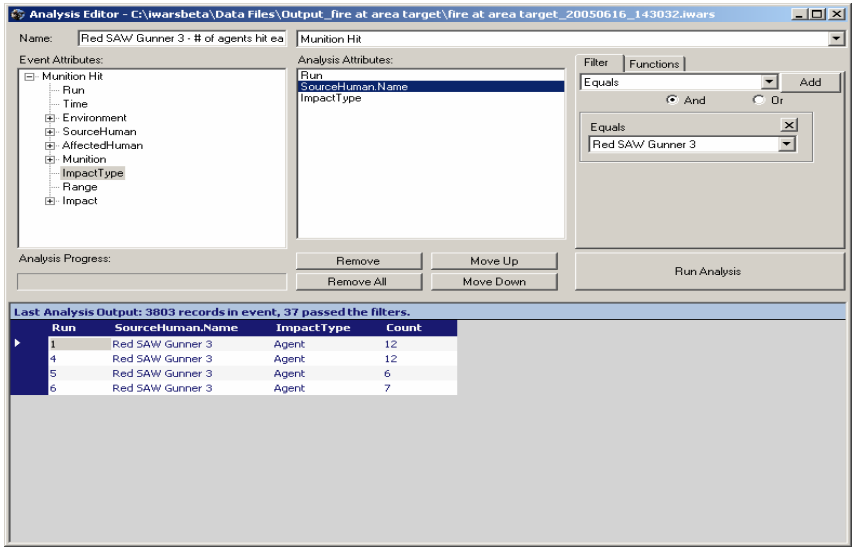
- Standard combat simulation MOPs
  - E.g., casualties, rounds fired, round impact locations
- Audit trail of entity actions and reasons
  - Actions performed, battlefield conditions at time of action, information on which the entity acted
- Data useful for scenario debugging
  - Enable user to quickly build scenarios with intended flow of activity

Output and Analysis

Output Analysis Tool

- Enables user to select desired MOPs and derive MOEs
- Import all IWARS output data from one or multiple runs
- Filter and analyze output pertaining to IWARS events
- Further analysis easily performed in any spreadsheet application





Modeling Challenges

- Computational complexity
  - Simulating a complex system on a desktop PC
  - Sometimes difficult to balance need for “good” representation and fast simulation runs
- Most important next-generation product is a moving target
  - Analysis priorities can change rapidly during development period

Modeling Challenges

- Representation of the human system
  - Each human is different
  - Existing methodologies often are either too detailed or not detailed enough for our purposes
- Availability of data
  - Conceptual next-generation equipment not always well-defined
  - Characteristics and data difficult to obtain during (and after) hardware development process
  - Methodologies for next-generation tools do not exist, and data does not exist for conceptual items

Summary

IWARS...

- Focus is analysis of ground soldier systems modeling
- Complex model of individuals and combat environment
- Continued development is important to provide RDA analyses of current and future small-arms and small-unit equipment and tactics
- Recognized by Army, NATO and others as useful tool for acquisition analyses
- Leverages existing efforts to enhance the representation of equipment and capabilities of ground soldiers


AMSAA
Excellence in Analysis


IWARS
Infantry Warrior Simulation


IWARS
Infantry Warrior Simulation

Small Arms Systems

National Defense Industrial Association (NDIA)

Armament Division

2007 Division Status

7-10 May 2007

The Links – Who, What, Why

National

- All services
- Industry
- Jointness
- International

Defense

- Worldwide Threats
- Homeland Defense
- Readiness
- Technology and Operational Superiority

Industrial

- Industry Organization
- Spokesman for Industry
- Resources
- Capability/Readiness

Association

- Visions
- Innovative Solution
- Communication
- Sharing
- Jointness
- Linking Government and Industry

An Organization Ensuring Strength Through Industry and Technology

Armament Division 2007 Focus Emphasis

- **"Branding"—National Defense Industrial Association (NDIA)**

  As THE:

  - **Voice of The Industrial Base**
  - **Promoting a Responsive and Vigorous Government and Industry National Security Team**

- **Involving NDIA Membership in Association Activities**

- **Addressing Strategic Focus Planning Initiatives**
  - **Communicating the Vision of NDIA Mission**
  - **Addressing Program and Activity Changes to Benefit Members**
  - **Conducting Studies and Programs which Have Impact**

  – ***Strengthening the Government-Industry Team to Ensure Readiness and Response--- Focused to Warfighter Capability***

NDIA Missions

- **Advocate: Cutting Edge Technologies, Superior Weapons, Equipment, Training, and Support for America's 4 and First Responders**

- **Promote: Responsive and Vigorous Government-Industry National Security Team.**

- **Provide: Forums for the Exchange of Information between Government and Industry on Matters of National Security.**

Organization Objective: ***Provide "Value Added" Symposiums and Activities Ensuring Mission Objectives***

Government—Industry Partnership Challenges

- ***Ensuring Responsiveness, Readiness, and Capability Superiority Today and in the Future***
  - **Balancing the Program Activity to meet Needs:**
    - **Maintaining Response to Current and Urgent Needs**
    - **Innovation to Meet Changing Threats**
    - **Evolving Superior Technology for the Future**
    - **Developing New Systems for Evolving Requirements**
    - **Addressing Reset, Refurbishment, Repair etc.**
    - **Ensuring Industrial Base Capability for Future Consideration of Links with DOD Organic Base**

- ***NDIA Mission and Activities Enables the Government-Industry Team Focus on Achieving the Needed Balance***

Bottom Line

NDIA Focus → Responsive to Industry/DoD Community → Ensures Relevance

Addressing Issues Critical to Guns and Ammunition, Missiles and Rockets Systems

Armament Division Focus— "Value Added" Activity

- Expanded participation
- Resource for government and industry
- Linked to key DOD and service strategies
- Capture "lessons learned" → ensure readiness → shape future
- Encouraging leverage of complementary systems
- Effective use of exhibits, demonstrations, and tours

Establishing Vision for 21st Century Relevance

Addressing Transformation—Ensuring Readiness

Leadership

Objective: Coordinated Focus and Vision for Armament Systems

Armaments Division

Dave Broden

Committees

Small Arms Systems

Brian Berger

Gun And Missiles Mike Till

Guns/Ammunition

Rockets/Missiles

Future TBD

TBD

Responsive Organization – Ensures Relevance

Scope – Area of Interest – Responsibility Definition Clarity

Establishing and Ensuring Strategic Focus

Themes, areas discussed; no specific action

Symposium Attendance Realizing Growth

- **Gun and Missile Systems**

  Attendance---350-500 in last 5 years

- **Small Arms Systems**

  Attendance—400-550 in last 5 years

Expanded Participation

Strategic Focus

New Attendees and repeat attendees

Growth of Exhibits

Continued International participation

- **Interest and Activity Strategically Focused**
- **Armament Division meets Needs of Government and Industry**

Committee Scope

Gun and Missile Systems

Small Arms Systems

- Individual weapon(s)
- Crew served weapon(s) (e.g., ≤ 40mm)
- Lightweight Systems
- Ammunition
  - Enhanced/lightweight
  - "Green"
- Full life cycle management
- Supportability
  - Training
  - Logistics
- Target Acquisition/Fire Control System (TA/FCS)
- Remote Stabilized Turret System
- System Integration
- Networked capabilities
- Non lethal
- Homeland Defense systems

Guns and Ammunition

- Medium caliber systems
- Tank systems
- Mortar systems
- Artillery systems
- Naval gun systems
- Aircraft/helicopter systems
- Precision systems
- Platform Integration
- Manned/robotic applications
- System integration
- TA/FCS
- Supportability
- Life cycle management
- Stabilized Turret System

Missiles and Rockets

- Tactical missiles and rockets
- Shoulder Fired Systems
- Ground launched
- Aircraft/helicopter launched
- Precision Systems
- System Integration
- Manned/robotic applications
- Life cycle management

Synergism → Commonality

Common Enabling Technologies, Modeling/Simulation, Man-Tech

Links to Other Committees

Small Arms Systems

Meeting the Needs of Our Joint Ground Forces in the Fight Against Terrorism

Address and Focus on the Theme

DoD and Homeland Defense Capabilities

- Joint Force operations and capability
- Response to asymmetric threats
- Adapt systems and technology for operational flexibility — Jointness
  - Responsiveness
- Push technology envelope(s)
- Push integration efficiencies
- Add functional capabilities
- Introduce new systems
- Ensure readiness and capability

"Lessons Learned" — Readiness/Capability — Responsive Force — Jointness — Technology Change

Shape the Future — Enable the Force

Linking to Theme

Meeting The Needs of Our Joint Ground Forces in the Fight Against Terrorism

- Understanding the Need
- Joint Requirement(s)
- Requirements Pull
- Technology Push
- Readiness/Capability/Responsiveness
- Direct Integration
- System Integration Adaptations
- Spiral Development
- Supportability

- Threat Specific Solutions vs. Capability Driven and Adaptable
- Operational Flexibility and Responsiveness
- Industrial Base Readiness
- Spiral Development

Response to Symposium Theme

– Adaptable, Innovative, Visionary, Capability Focused

2007 Symposium—Gun and Missile Committee

Guns and Ammunition

Rockets and Missiles

Meeting Warfighter Needs for the Asymmetric Threat

Addressing the Theme!

- **Joint Capability**
- **Joint Requirements**
- **Readiness Capability**

Applying Common Advanced Technologies and Integrated Systems

- Capability focused complementary integrated systems
- Strengthening Legacy Systems while evolving "new"
- Address key force multipliers
  - Precision
  - Mobility
  - Communication
  - Situation awareness
  - Lethality
- Planning and implementing Spiral Development
- Building on "lessons learned" for future readiness
  Priority to supporting the Warfighter
- Ensuring responsive industrial base capability
- Attention to life cycle management

Enabling an Integrated and Responsive Joint Force Capability

Vision: Readiness for Today and the Future

Joint Services: Defining and Executing the Change

Industry: Ensuring Technology and Product Availability – Evolution

Asymmetric Threats

Joint Operations

Joint Requirements

Transformation Initiative

Readiness

Simultaneously

Changing the Force

Responsiveness – Technology – Capability
and

Maintaining Readiness

of
Existing Forces

Industry Responding to Joint Force Needs

2007 Armament Division Highlights

- Symposium **Attendance** Strong and Growing
- Symposium **Exhibits** Effective and Quality Enhanced
- Attention to **Strategic Focus** Topics Enhances Effectiveness
- **Executive Committee** activity strengthened an increased
- **Government and Industry Partnership** in Division leadership demonstrated

Armament Division leadership strength enables strategic focus to address current and future needs

Armament Division Strategic Focus

- **Strategic Focus Request from NDIA Board of Directors**

- **Strategic Focus Purpose--- Ensure NDIA Missions are Achieved**
  - **Advocate**
  - **Promote**
  - **Provide**

- **Strategic Focus Armament Division Response ---**
  - **Input from each Committee**
  - **Topics Addressing Armament Division Effectiveness Submitted**

- **Strategic Focus Benefits—**
  - **Committee Action to Implement Changes –**
  - **Committee Mission Focused to Specific Actions for Armament Community**

NDIA Missions

- **NDIA Missions Shape the Strategic Actions of All Divisions**

- **Mission Statements**

  - **Advocate:--Cutting Edge Technologies, superior weapons, equipment, training, and support for America's Warfighter and First Responders.**

  - **Promote:--Responsive and Vigorous Government—Industry National Security Team**

  - **Provide:--Forums for Exchange of Information Between Government and Industry on Matters of National Security**

Armament Division

- **Strategic Focus Topics Addressing Armament Division**
  - Relevance to Current and Future Capability
  - Strengthening the Industrial Base
  - Building a Team—Government and Industry
  - Promoting Communication with “Value Added”

- **Linked to NDIA Mission Statements**
  - Advocate
  - Promote
  - Provide

- **Why the Strategic Focus?**
  - Clarify and Emphasize NDIA Mission
  - Enable Division to Impact Government/Industry Team Needs
  - Encourage Membership Actions

Armament Division

• **Focus Area/Objective:** **Establish a Mentor/Protégé relationship throughout the Armament Division** ---Industry and Government to ensure succession planning and technology/experience transfer in all aspects of defense business and in conduct of NDIA committee operations.

•**Narrative:** There has been much discussion regarding the decline of the workforce and the emerging shortage of technical staff. One component of this consideration is the mentoring of the new to ensure transfer of technology and experience thus supporting succession planning. The committees Executive Committees can be used as a resource for mentor/protégé of the NDIA--enabling an effective transition of the organization. This should be structured with the thought of moving the process into the industry members and later into the government agencies.

Strategic Focus Topics

1. **Ensure Understanding of NDIA Role, Mission, and Benefits**

2. **Establish Mentor Protégé Relationships**

3. **Ensure Symposium Theme flows throughout the Program**

4. **Address Symposium Content which will "Impact" Programs, Technology, and Approaches**

5. **Increase Industry Leadership in Symposium Presentations**
   Increase Industry Communication of Innovation etc.

6. **Enhance Symposium Quality Thru Innovation and Intra-Divisional Teams—Sharing Ideas and Approach**

Strategic Focus Topics (Continued)

7. Establish Executive Committee Focus Subcommittees for Selected Technologies/Systems or Priority Topics.

8. Address Industrial Base Readiness for Transition to Reduced Level of Activity—And Readiness for the Next Event

9. Expand Emphasis of Platforms, Systems Integration and Enabling Technologies in the Armament Division Programs

10. Other Topics to be Addressed by Executive Committee
    - Executive Committee Initiatives
    - Symposium Attendee Initiatives/Suggestions
    - Requests from NDIA
    - Requests from DOD/Agencies

Strategic Focus—Study Topic Priority

- **Strategic Focus**: Gun and Missile System Committee was asked by General Cannon –PEO Missiles and Space to validate the need for a multi-year plan addressing needs for maintaining and establish next generation tactical missiles.

- **Armament Division Response**: An NDIA Study will be initiated to address the topic in coordination with the PEO. Committee will include members from industry addressing technology, development, and production base topics. Results are an independent view of what is required

- **Armament Division has responded to a challenge.**

- ***Question are there similar challenges in the Small Arms Community?***

Executive Committee Improvement Topics

1. **Clarify Caliber and System Responsibility of Gun and Missile Committee vs. Small Arms Committee**

2. **Address Integration of Precision Strike Component of NDIA**

3. **Increase User Community Involvement**

4. **Address Symposium Presentation Quality**

5. **Address Symposium Presentation Mix –Industry vs. Government and type of Presentations—Requirements, Acquisition, Platforms, Systems, Technology, Industrial Base etc.**

6. **Improve "Value Added" of Keynote Speakers**

Executive Committee Improvement Topics

7. Include Requirements Segment in All Symposium Programs

8. Capture and Address Attendee Suggestions/Recommendations

9. Expand Use of Panel Discussions

10. Utilize New Formats for Presentations and Consider "Kiosk" Approach for Additional Papers.

11. Link Exhibits to Theme – (If practical and Affordable)

12. Executive Committee Structure and Operation

13. Conduct Special Studies

14. Add New Committee (e.g. Integration Focus, Precision etc.)

Armament Division Strategic Initiatives

- 1. Armament Division— Strategic Focus based on Committee Input
- 2. Monthly Division Chairman Telecoms--Plan Improvement
- 3. Executive Committees Identifying and Addressing Focus Areas
  - Strategic Focus Topics
  - Committee Initiatives
  - Symposium Input and “Lessons Learned’
  - Response to DOD or Agency Requests
- 4. Requesting Symposium Attendees Communicate/Share Ideas, Suggestions, Concerns, Topics etc.
- 5. Goal to Not be Static Organization— Change to Address Relevant Topics and Interests.

Armament Division Focus Topics

1. Ensuring Capability for the Warfighter
   - Current Systems
   - Refurbishment/Repair– Industry and Depot Responsiveness
   - Expendables
2. Responding to Urgent Technology/System Needs
   - "Lesson Learned" Responses
   - Adapting to Asymmetric New Threats and Conditions
3. Maintaining and Adapting the Industrial Base
   - DOD Organic Base
   - Industrial Base
4. Establishing and Transitioning New Technology and Systems
   - Requirement Process Effectiveness
   - Program Decision Milestones
   - Schedules/Spiral development and Technology Insertion
   - Funding

Armament Division Focus Topics (continued)

5. Understanding Budgets and Funding
   - Shaping Development Plans leading to New Systems
   - Maintaining Production to ensure Readiness
6. Addressing Acquisition Change Considerations
7. Transitioning the Workforce
   - Attention to DOD Technical Manpower Study
   - Mentoring effectively
   - Enabling the entry Workforce
8. Evolving New Technology To Readiness for System Applications
   - Understanding the Need
   - Technology Insertion —Insertion Before the Next Technology
   - "Maintaining Innovation" thru effective Industry and Government investments
9. Maintaining Technical Data Packages (TDP's) vs. Performance Spec and consideration of Intellectual Property etc.

2007 Top Defense Issues

- **Issue 1: Maintain Integrity---Responsiveness of Acquisition Process**
- **Issue 2: Promote Defense Workforce Sustainability**
- **Issue 3: Invest in Defense Industrial Base Technology to Support Warfighter and Maintain Readiness**
- **Issue 4: Improve Small Business Utilization**
- **Issue 5: Preparing for Transformation**
- **Issue 6: Ensure International Competitiveness of US Industry**

NDIA Board of Directors Approved Focus
NDIA Focus Issues to Congress

NDIA International Symposium Links

Objective: International cooperation and integration of symposiums benefiting industry and Department of Defense to encourage partnerships for development, production, and interoperability

Approach:

- Coordination of NDIA Armament Division programs with "Symposium at Shrivenham" The Royal Military College of Science
- Common presentations and panel participants is a strong "open door" resource

European Small Arms and Cannon Symposium

August 2007

NDIA Communications

- National Defense Magazine
  - Emphasis on relevant and timely topics
  - Frequently source of media, DoD, and Congressional reference
- Website
  - Symposium presentations available — attendee access
  - Complementary information
  - Full list of activity
- Top public policy issues — prioritized — addressed to Congress — strengthen the community

NDIA Messages and Content Has Impact

and

Website Used Extensively as Resource

Armament Division 2007 Challenges

- Ensuring Focus on NDIA Mission Statement
- Addressing Armament Division Strategic Focus Topics
  - Enhancing Membership "Value Added"
- Capturing Symposium Attendee and Membership Topics of Interest in Programs and Activities
- Ensure Membership Awareness of Top NDIA Congressional Issues and Impact
- Seek Symposium and Related Activity which Impact Capability and Responsiveness

Strategic Focus Emphasis

- **Effective Communications and Links Across Government and Industry**
- **Ensuring Innovation in Technology and Systems**
- **Strengthening the Industrial Base —Recognizing the Need**
- **Building an Integrated Team —Industry and Government**
- **Promoting Communication with "Value Added" Content**

Leadership Vision

NDIA Armament Division Is:

- **A relevant voice and forum**
- **Meeting NDIA Mission Statements with Strategic Focus**
- **Responsive to DoD community and industry challenges**
- **A forum for DoD/industry interaction discussion of "lessons learned" and needs**
- **Supporting national defense through people resources, networking, and symposiums**
- **Transforming to ensure relevance to changing military, geopolitical environments, technology, and industrial base resources**

The NDIA Community is the Resource of Choice For Excellence in National Defense Topics/Communications

NDIA Division Focus Areas
For 2007
Armament Division

12 March 2007

Prepared by:
Dave Broden
Division Chairman
Contributors: Mike Till—Guns and Missiles
Brian Berger—Small Arms

Armament Division

Committees

1. Guns and Missiles ---Mike Till Chairman

2. Small Arms Systems --- Brian Berger Chairman

Armament Division

• **Focus Area/Objective:** **NDIA Division Executive Committee understanding of NDIA Mission and Purpose**

•**Narrative:** Division/Committee Executive Committee Members do not have a clear understanding of the mission, purpose and objectives of NDIA. As a result the committee activities are not consistent with the Advocate, Promote, Provide themes. As a result the committees provide programs only without the thought of impact to the industrial base and/or providing capability to the warfighter. Armament Division is seek to discuss this at each committee meeting. Executive Committee members must become more than meeting planners they must be ambassadors for the NDIA and its mission in all respects.

Armament Division

- **Focus Area/Objective: Ensure Symposium theme is reflected in the program content.**

- **Narrative:** Many Symposium reflect the mission of the Committee but not the theme established by the committee. This is often driven by the “call for papers” process which identifies papers which are very general. A more disciplined process linked to the theme and requiring that the executive committee members “force” the issue to the theme is under discussion. Committee must become leaders and trend setters not just planners.

Armament Division

• **Focus Area/Objective: Include Symposium Content that will "Impact" Programs, Capability, Resources not only Report Status**.

•**Narrative:** Symposium often focus on reporting what has been going on or what is going on rather than making statements or presentations which offer change or capability which will impact how programs or capability is achieved. NDIA is the key format to have this "open" dialogue of what is needed to "impact" program etc. We are discussing how to effectively include this element of program content.

Armament Division

- **Focus Area/Objective: Ensure Armament Division Symposium have a Strong Industry and Industrial Base content vs. focus on government activity**

- **Narrative:** Armament Division Symposium have seem a decrease in industry focus and presentation participation while government papers are increasing. As the “I” in NDIA states the organization is to promote the Industrial Base—a plan and thrust to return to communicating the innovative and resource readiness activity of industry is evolving.

Armament Division

- **Focus Area/Objective: Symposium Content and Quality Enhancement thru Intra-Divisional Innovation Teams**

- **Narrative:** The two committees of the Armament Division—Small Arms and Guns and Missiles have agreed to for cross committee working groups of 2-5 Executive Committee personnel to address topics with objectives to address improvement or changes in the format and content of the Division Symposiums. This is underway.

Armament Division

- **Focus Area/Objective: Executive Committee Focus Subcommittees to ensure in-depth presentations on priority topics**

- **Narrative:** There is a recognized need for the Executive Committees to seek and obtain presentations for symposiums on high priority topics and trends. To address this executive committee subcommittees of 3-5 members will focus on a particular technology, system, or topic and ensure in-depth symposium content.

Armament Division

- **Focus Area/Objective: Armament Division Industrial Base Readiness for transition from war to peace capability—discussion of what should be the industry response.**

- **Narrative:** The products, technology, and systems of the Armament Division are uniquely sensitive to volume capability. There is a need to provide a forum addressing the downturn and how Industry should prepare for it and when. This NDIA activity should reach across multiple divisions.

Armament Division

- **Focus Area/Objective: Including System Integration and Enabling Technologies in the Armament Division Symposiums is often overlooked—expanded emphasis is a focus need.**

- **Narrative: Armament Systems require attention to System Integration (platforms, fire control, feed and storage, logistics etc.) and also specific enabling technologies. Industry has significant technology and innovation to support this system focus. The Executive Committee is seeking to strengthen the links to these areas in Executive committee membership, presentations, and participation.**

Armament Division

- **Focus Area/Objective:**

- **Narrative:**

Armament Division Success

Guns and Ammunition/Missiles and Rockets

Small Arms Committee

Value Added Has Been Demonstrated

Leadership to Strengthen the Armament Community

Challenge: Applying Technology, Systems for Future Force

Ensuring Readiness . . . . Responding to the Challenge Advancing Superior Capability

Symposium Benefits Confirmed

“Value Added” –Strategic Focus

Symposium Observations

Linking NDIA and DoD Realized

- Improved links to DoD and service thrusts and initiatives
- Interest in "after action reports" — "lessons learned" → industry responsiveness → addressing challenges

Symposium Quality and Communication Demonstrated

- Presentation quality improvements and "So What" benefit messages have added value
- Focused interest in systems level presentation vs. technology unless technology offers payoff vision
- Industry adjusted to intellectual property concerns and expanded participation positively
  - Industry worked with vision

Armament Division 2007

Ensuring Relevance

- Evolve executive committees
  - Integrate relevant organization(s) for future
    - Industry
    - Government
- Improve division charters to ensure relevance/clarity
- Symposium themes
  - Future "vision" focus
  - Emphasize Readiness topics
- Symposium content
  Focus on "Value Added" for attendees
  - Emerging technology and capability
  - Panels
  - Interactive format
- Attendees
  - Participation is growing resource

Armament Division is Key to Current and Future Force Capability

Armament Division 20067 Highlights

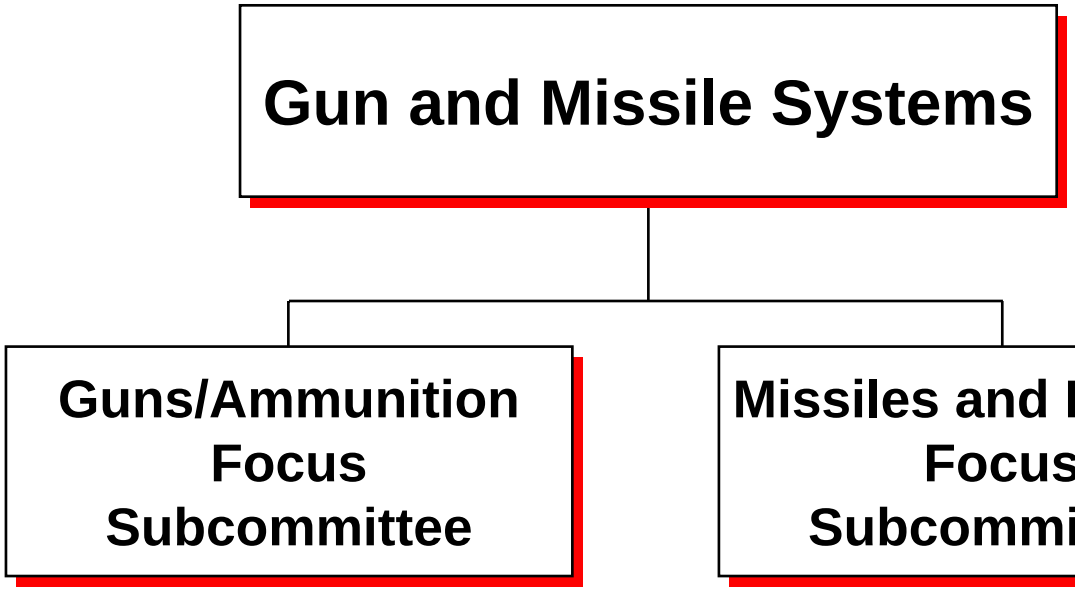
1. Focus on relevant and "value added" topics
2. Solid links to Transformation and future topics
3. "Lessons learned" and "after action reports" input shapes the future
4. Recognition of need to address industrial base readiness — capability — responsiveness---capability today and the future
5. Executive committees focused to objectives
6. National Small Arms Center established/operational
   - 50+ companies
   - Program planning addressing GAPs in-process
   - Procurement activity realized

   Budget process moving forward effectively
7. Continued panel discussions focus to key interest topics
8. Recognized forum for business/technology "networking"

2007 Armament Division Highlights

- **Leadership for National Small Arms Consortium and Center**
  - Executive Committee
  - Research Committee and Subcommittees
- **Participation in Industrial Base Status and Needs Briefings**
  - Communication of Situations, Changes and Actions
- **Armament Division Executive Committees demonstrated Leadership**
  - Multiple Meetings
  - Expanded Participation
  - Shaping the Future
- **NDIA Armament Division Contacted by Government and Industry for expertise to address specific needs---**
  - **Talent and Experience benefited specific activity**

Committee Structure



Chairman,
Mike Till

*May be 1 or 2 subcommittees

Organization Focuses on <u>Commonality</u> and <u>Synergism</u> and Provides <u>Links</u> to the Two Components

Guns, Ammunition, Rockets, Missiles Section/Committee---Gun and Missile Systems

Committees were	Committee is
Guns and Ammunition	, Gun and Missile Systems
Missiles and Rockets	

Benefits Realized

1. Commonality NDIA membership
2. Leverages convergency of technology and systems
3. Stimulates discussions — dialogue
4. Symposium attendance efficiency (one vs. two meetings)
5. Brings separate communities together for common purpose

Symposium Interest, Attendance, and Dynamics Enhanced

2006 Top Defense Issues

- Issue 1: Sustain the Defense Industrial Base
- Issue 2: Sustain Overall Military Readiness While Continuing the Global War on Terrorism and Preparing for Future Defense Transformation
- Issue 3: Improve the Integrity and Responsiveness of the Acquisition Base
- Issue 4: Improve Small Business Opportunities
- Issue 5: Strengthening the National Security Workforce

NDIA Board of Directors Approved Focus

Established by Government Policy Advisory Committee

Look to Web Site for Full Details

These Issues are NDIA Membership Voice to Congress

Take-Away Thoughts

- NDIA is strong and valuable
  - Resource use enables timely/responsive solutions
- Armament Division has Strategic Focus —Implementing Objectives
- Multi-discipline capability links NDIA Divisions
- Listen to "*lessons learned*" and jointly enable *readiness* capability
- Commitment to "value added" changes
  - Strategic Focus Initiatives
  - Understanding of Responsiveness Issues
  - Emerging Changes in Acquisition
  - Attention to Industrial Base Readiness Needs
- Attendee participation/input strengthens organization

Executive Committees Impacting Activity
Strategic Focus Changes
Ensuring "Value Added"





Industry Perspective
Panel Discussion

Small Arms Weapon Systems
Vision Forward
Approach, Technology, Capability, Barriers

NDIA
Small Arms Systems Symposium
7-10 May 2007

Objectives

- **Overview Industry Perspective—Small Arms Systems**
  - **Today**
  - **Vision Ahead**
- **Identify Challenges and Opportunities**
- **Confirm Small Arms Vision for Future Focus**
  - **Response to Requirements/Needs**
  - **Innovation**
  - **Performance**
  - **Industrial Base Capability**

Panel Members

- FN Manufacturing
- Colt
- Smith Wesson
- Knight Armament
- Barrett Firearms
- Heckler and Koch (Invited)
- Remington (Invited)
- Beretta (Invited)

Panel Approach

- **Each Panel Member Presents a Company Vision**
  - **(1-2 slides or Comments)**
- **Discussion among panel members moderated by Dave Broden**
- **Questions and Answers from the Symposium Attendees**
- **Wrap up/Summary Comments by Each Panel Member**
- **Wrap Up by Dave Broden**

Panel Discussion Time---1 Hour

Wrap-Up--Conclusion

- **Demonstrated Response to Urgent Needs and Rapid Acquisition Confirms Focus and Capability**
  - Industrial Base Evolved to Meet Demands
- **Systems Focus to Innovation and Technology Application**
  - User Friendly Design
  - Performance Focus
- **Continuously Evolving Focus to Address Future**
  - New Systems
  - Industrial Base Modernization and Improvements
    - ***Confirming Responsiveness and Readiness of Industrial Base Ensuring Warfighters Capability***

What is Shaping the Small Arms Industry

- Legacy and Legacy Demand
- Requirement Trends
- Technology
- Related Technology and Subsystems
  - Ammunition
  - Fire Control
  - Logistics
- System Integration Trends
- Cost per System
- Cost/Schedule to Develop and Deploy New Systems

Panel Topics

- **Assessment of Small Arms Status Today**

- **Impact of Current World Conflicts—Establishing "Lessons Learned"**
    - **Requirement Drivers----Technology Push/Opportunity**

- **Opportunities and Approaches for Small Arms Technology Changes**

- **Barriers to Achieving Changes and Ensuring a Vision**

- **Resource Availability---Funding—Manpower**

- **Procurement Requirements vs. Production Capacity**
    - **Industrial Base Today and the Future**

Topics

- **“Lessons Learned” Based on Current Conflicts**
- **Response to “User Suggestions and Evolving Requirements”**
- **Technology Application and Needs**
- **Barriers to Changes and Future Capability**
- **Ammunition Alternatives and Changes—Impact and Influence**
- **System Integration Considerations—Fire Control/Sensors etc.**
- **Industrial Base Readiness and Adaptability**

Improvements—Who—What--When

- **Small Arms Industry Improvements/Changes and Focus**
- **Total Industry Improvements/Changes and Focus**
- **User Community Changes and Focus**
- **Acquisition Improvements and Changes**
- **Other Considerations**

Barriers and Challenges

- Acquisition Complexity—Timing—Decision Process
- Development and Related Life Cycle Milestones
  - Development Time to Long
- Technology Changes before a Product is Fielded
- Risk Sharing and Management
- Rapid Acquisition Needs vs. Development Plans

Thoughts to Enable Vision

- **Barriers to Evolving to New Small Arms Systems and Capability?**
  - **System Requirements**
  - **Technology Readiness**
  - **Acquisition Process**

- **Development Process Approach and Decisions—What is the impact?**

- **Industrial Base Factors—What Readiness Guidelines will Ensure a Solid Future?**

- **Does the National Small Arms Center Offer Opportunity?**

Panel Considerations

- **Comments by Panel Members should be general in nature and not address any topic which may be considered proprietary or company sensitive.**

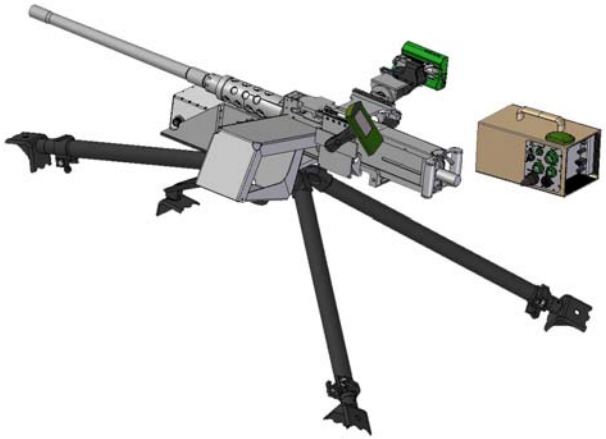
- **Panel is intended to show that Industry has a vision for the future of Small Arms and that this vision is attentive to innovation and new concepts**

- **A key aspect should be comments on the Strength of the Industrial Base for Small Arms and what is needed to ensure the strength of the base for the future.**

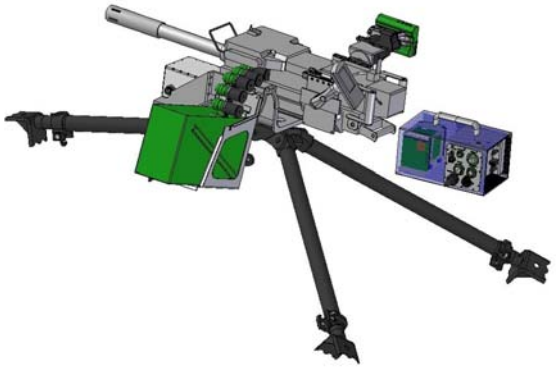
Top Three Observations and Actions

Top Three Observations and Actions

Heavy Machinegun Fire Control as a Distributed Operations Enabler



9 May 2007



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Harnessing the Power of Technology for the Warfighter

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Background

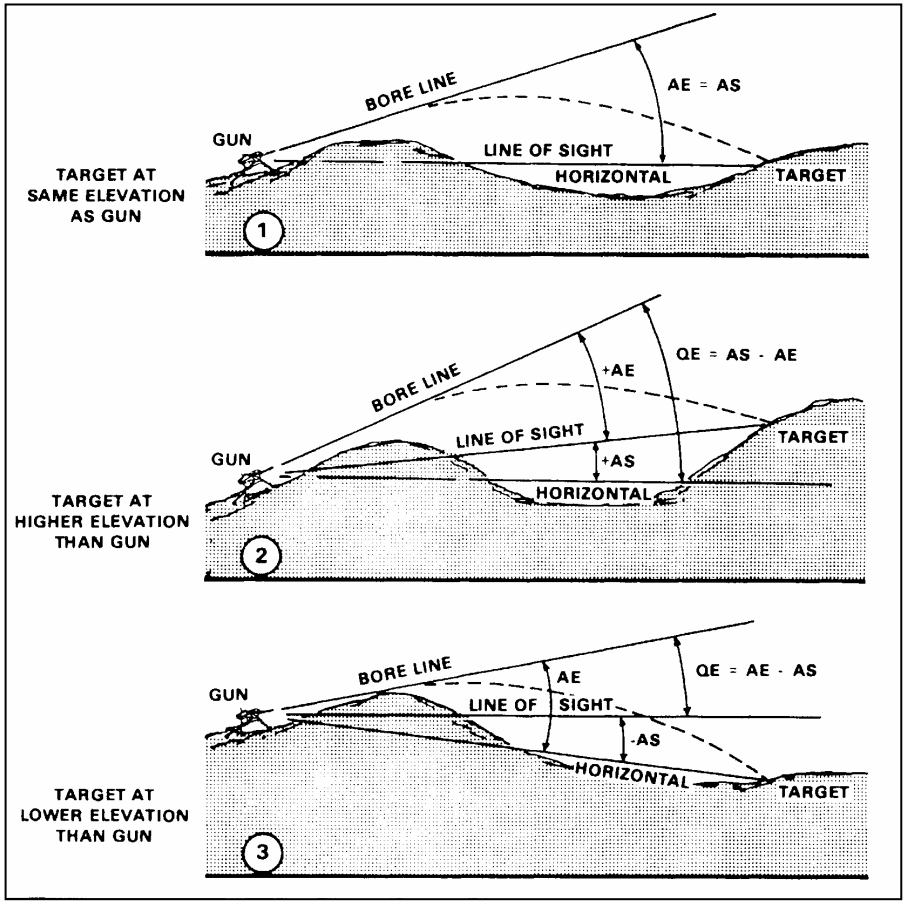
- **Request from ONR Code 30 Fires to address 40mm Indirect Fire feasibility as part of Improved Fire Control Systems FNC**
- **Proof of Concept demonstrator built and tested in late FY03**
  - **COTS components**
  - **In-house software**
  - **MCWL weapon/ammo/test support**

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Technical Approach

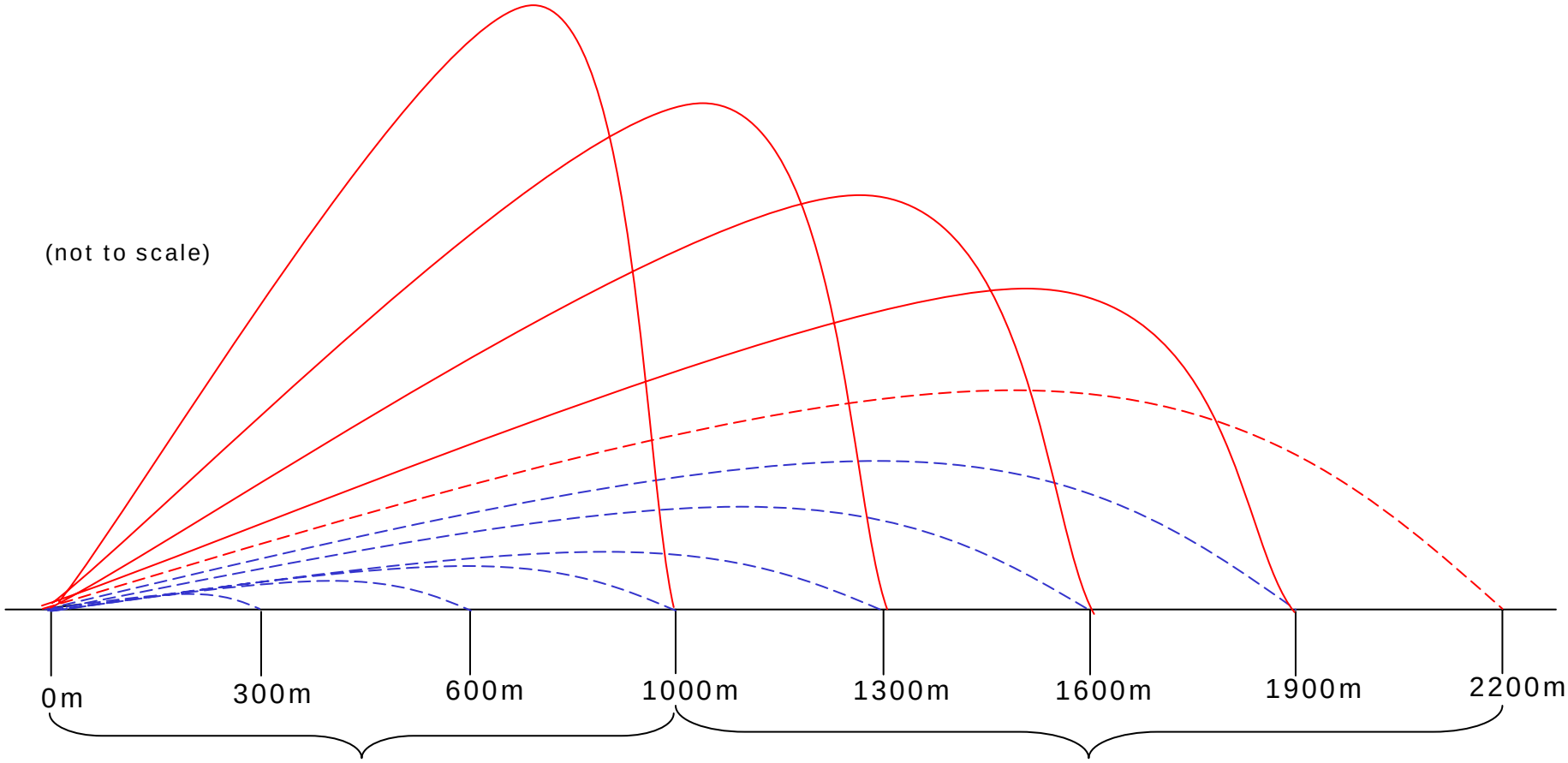
- Ballistic kernel calculates targeting solution using
  - Target & weapon geo-location
  - Inertial sensor for weapon attitude
  - MET data
- Provides aiming parameters to gunner when firing from defilade
- Lobbing trajectory allows substantial mask clearance at longer ranges
  - Hills
  - Trees
  - Buildings



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40mm Range/Trajectory



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Proof of Concept Test

- **Demonstrated 40mm Indirect Fire Proof of Concept**
  - **Used GD 40mm ALGL as test platform**
  - **Accurate to full range of weapon**
  - **Promising results exceeded user expectations**

- **Improvements needed**
  - **High-angle ballistic profile**
  - **Hardware integration**
  - **Software usability**
  - **Gunner interface**



Hawthorne, NV, 2003

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Emerging Guidance

- **Marine Corps Improved Heavy Machinegun (IHMG) UNS**
  - **Signed Nov 2003 by BGen Neller**
  - **Validated by DOTMLPF working group Feb 2004**
  - **Improved .50 cal and 40mm weapons**
  - **Common compatible mount w/ quick slewing capability**
  - **Direct and Indirect Fire Control with integral LRF**
  - **Common optics bench for current/emerging inventory sights**

- **Addresses Expeditionary Maneuver Warfare Capability Gaps**
  - **Enhance capabilities of infantry heavy weapons by incorporation of advanced fire control technologies.**
  - **Provide all-weather, fully integrated, and continuous lethal and non-lethal fires with extended range, volume, and accuracy.**
  - **Develop means to reduce time delay from target detection to identification and from target identification to engagement.**
  - **Provide extended, coordinated, and sequenced joint fires in support of maneuver elements.**

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HMG Indirect Fire History

- **Used effectively in WWI & WWII - “rain of slugs”**
- **Occasional use in Korea**
- **Foliage of Vietnam reduced opportunities**
- **New mounts did not facilitate high angles**
- **Instruction/Training lacking**
  - **Time and Ammunition intensive**
  - **.50 cal Indirect Fire is a lost art - no longer taught**
  - **40mm Indirect Fire only taught at MC Advanced Machinegun leaders course**
    - **45 minutes to set up a mission**
    - **Lucky to hit within a football field on first shot**
- **Lack of doctrine for accurate, coordinated, and timely employment**
- **Loss of expertise due to lack of use**

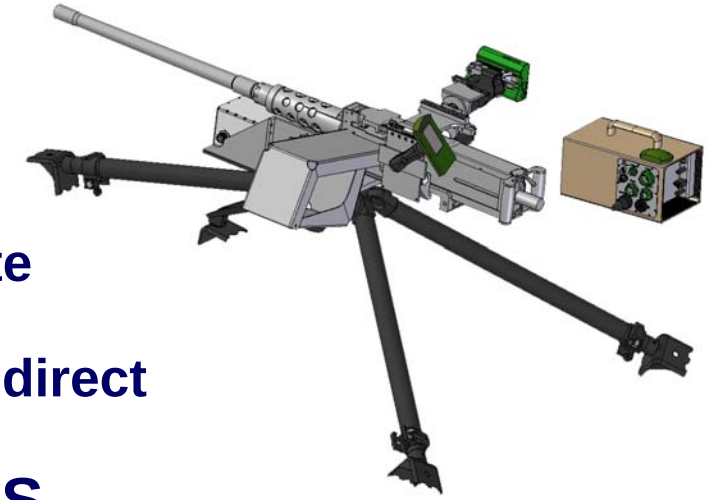


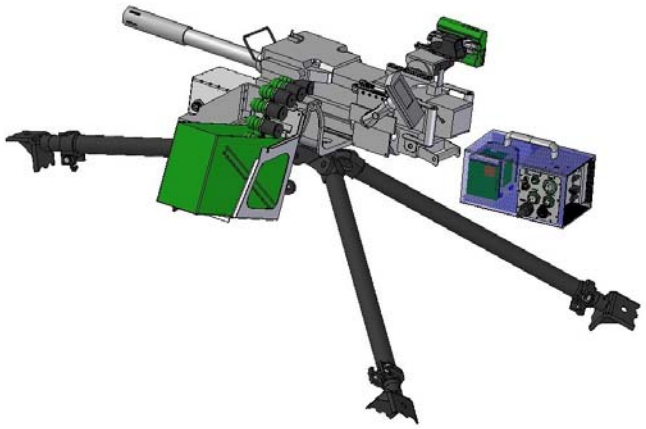


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Technology Opportunity

- **Major transformation for Heavy Machineguns**
  - **Extends practical useable range of weapons**
  - **Enables timely execution of accurate indirect fire**
  - **Increase in first round accuracy for direct fire**
- **Radical enhancement of CONOPS**
  - **Ideal for current conflicts & MOUT engagements**
  - **Situational awareness for heavy machinegun teams**
  - **Networked Fire Control allows**
    - **Direct sensor-to-shooter link**
    - **Call for fire support on targets of opportunity**
    - **Collaborative attack capability**





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Project Sponsors

- Office of Naval Research (ONR)
  - **Expeditionary Maneuver Warfare Department**
    - **Fires Thrust Area**

- Marine Corps Warfighting Lab (MCWL)
  - **Technology Division**
    - **Ground Combat Element Branch**

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Team Responsibilities

- **Technology Transition Agreement between ONR, MCWL, & MCSC signed June 2004**
  - **NSWC Crane (ONR Design Agent)**
    - **Fire control development**
    - **Communications / networked fires interoperability**
    - **Overall system integrator**
    - **Coordinate technology demonstration**
  - **MCWL**
    - **Advanced Common Mount (ACM) development**
    - **Evaluation of MK19 replacement candidates**
    - **Weapon, ammo, and range support for tests and demos**
    - **Operational demonstrations**
    - **Funded fire control completion and system verification test in FY06**

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Indirect Fire Employment

Forward Observer (FO)



FO Determines Target's Location and Adjust Fires

HMG with DF/IF capability





FO relays Targeting information



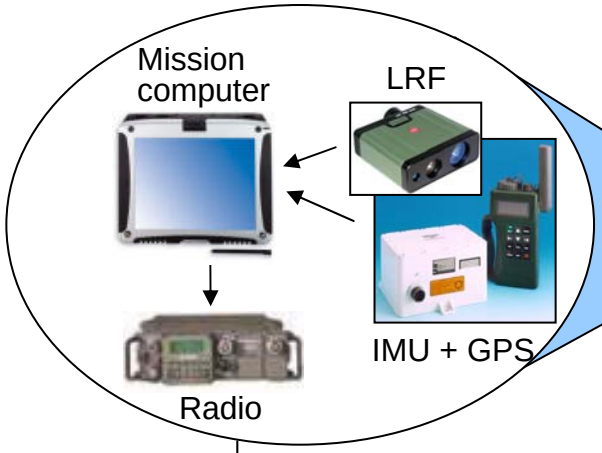
FSCC

Fire orders sent via JVMF

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Direct Fire / Sensor Employment



HMG with DF/IF capability



HMG determines target's location using LRF, IMU, and GPS

HMG sends digital target information via JVMF



FSCC

Fire orders sent via JVMF



Fire support asset delivers ordnance



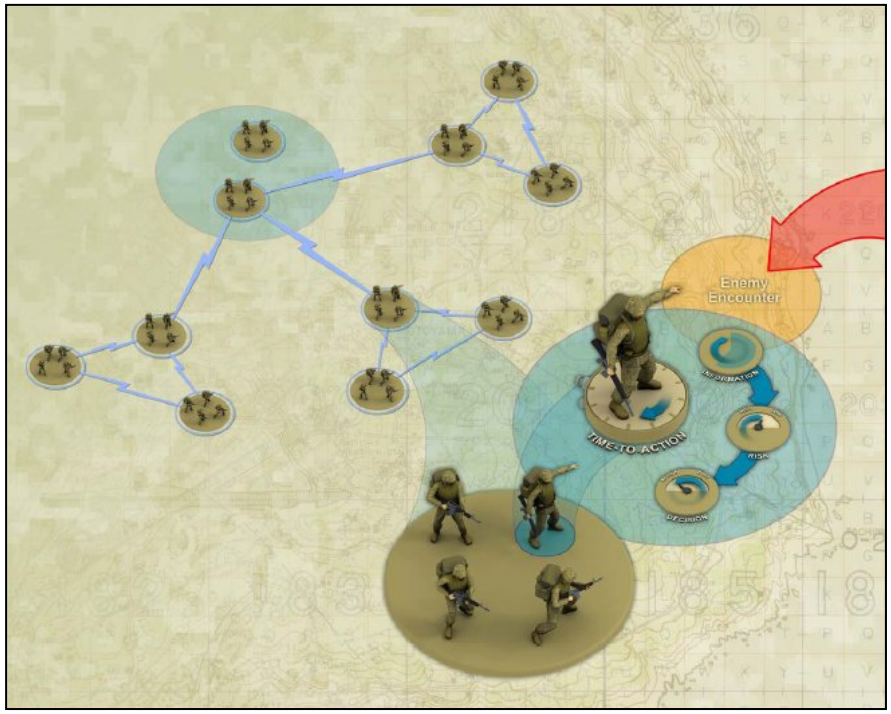


Enemy target

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Distributed Operations Enabler



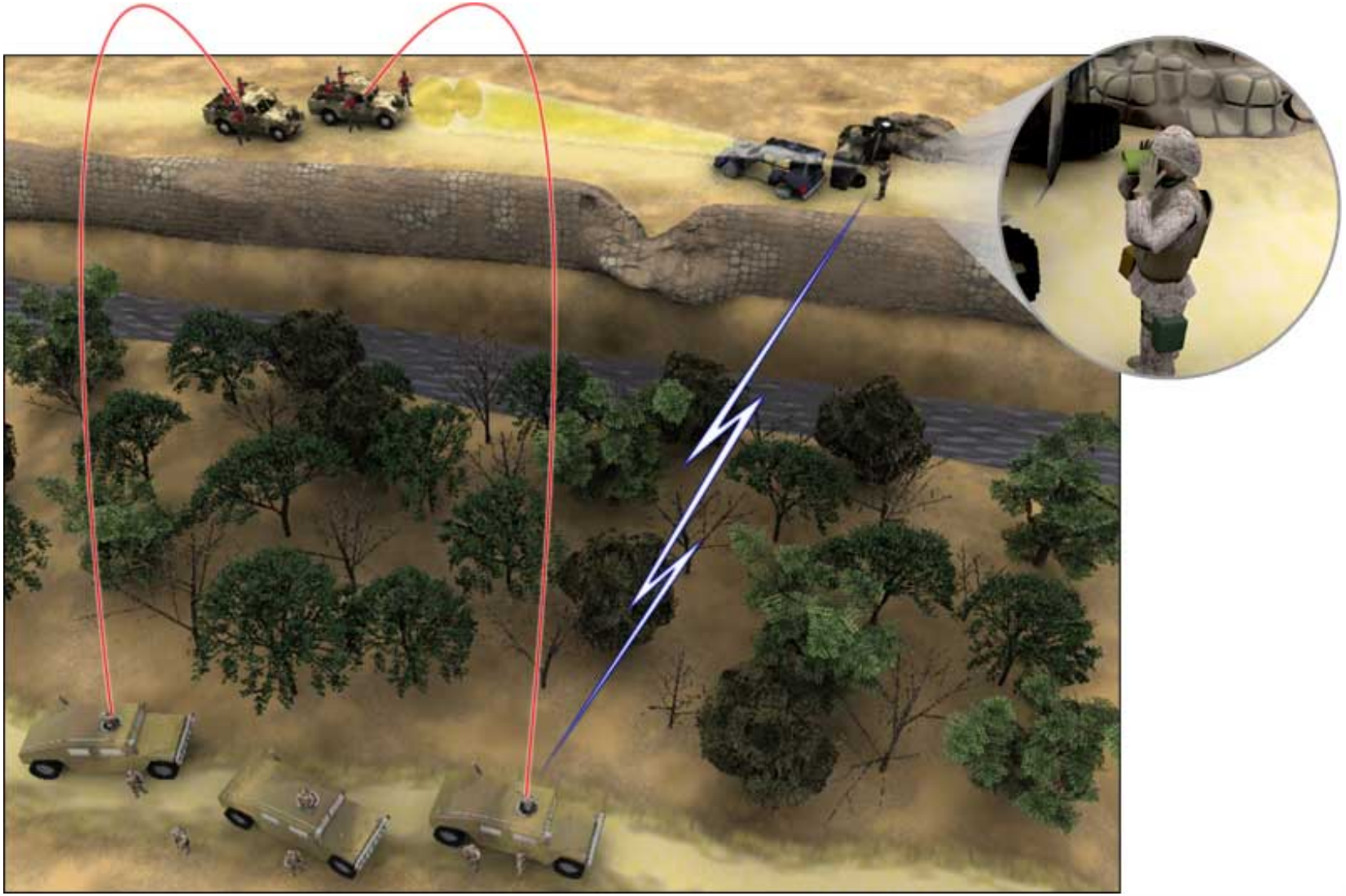
A Concept for Distributed Operations. 25 April 2005. Department of the Navy, HEADQUARTERS U.S. MARINE CORPS, Washington, DC.

- Provide the ability to distribute or re-aggregate depending on the threat.
- Provide the ability to quickly and accurately engage targets using a distributed processing architecture.
- Provide collaborative and coordinated engagement of targets.
- Provide teams that are multifunctional (sensor, shooter, and/or comms relay).

- Provide multiple teams a coordinated, interdependent approach to intelligence gathering, situational awareness, and target identification/location.

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Distributed Ops Application



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HMG Fire Control on CCM



Weapon Attitude Sensor

PLGR or integrated SAASM

Computing Platform

Optical Quadrant Deck

Gunner's Display

Common-Compatible Mount w/ std T&E

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HMG Fire Control on ACM

Vehicle Mount

Gunners Display

Dual Range Pedestal High

Optical Quadrant Deck

Dual Range Pedestal Low



Team Leaders Display

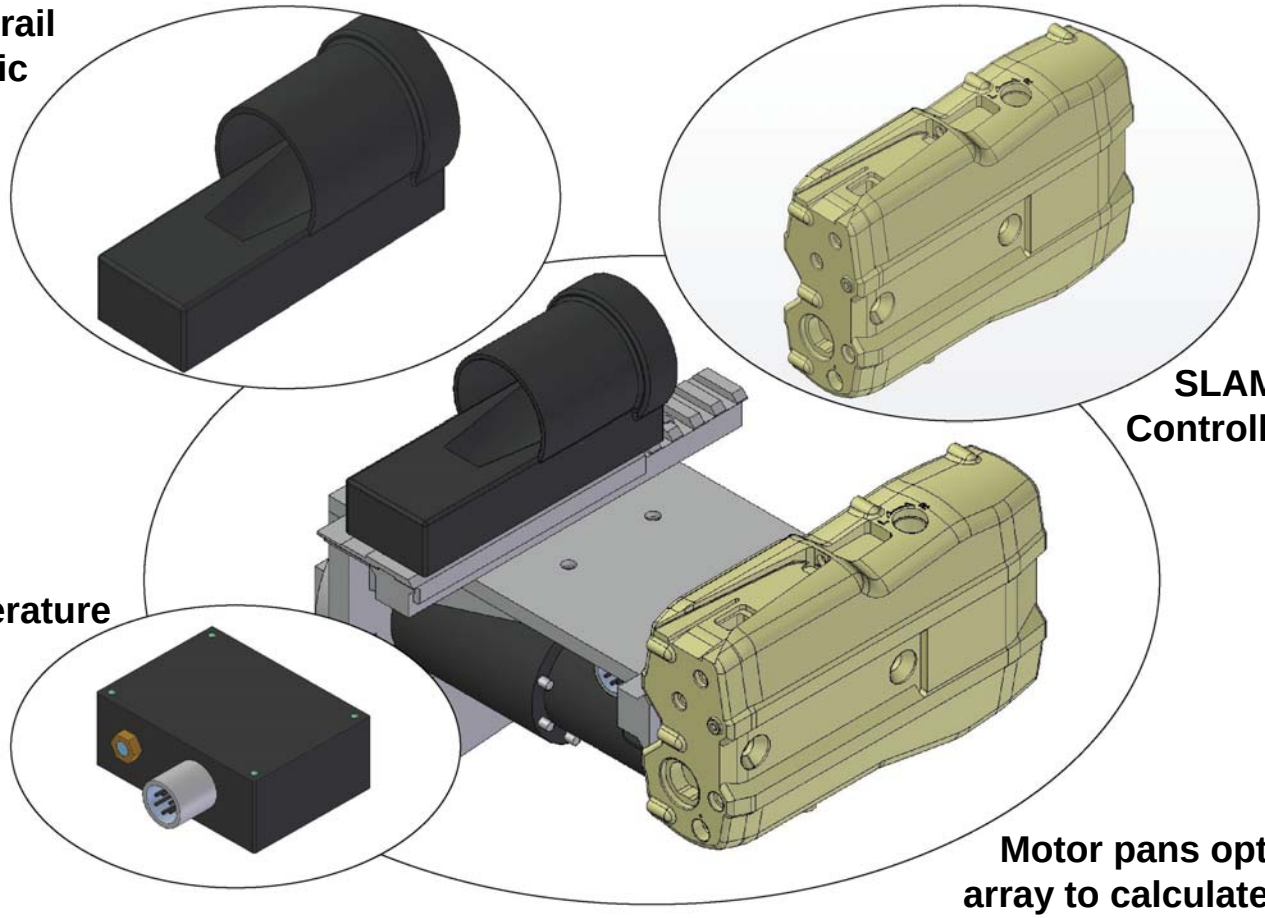
Computing Platform

Advanced Common Mount with Integrated T&E and Trigger Mechanism

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Optical Quadrant Deck

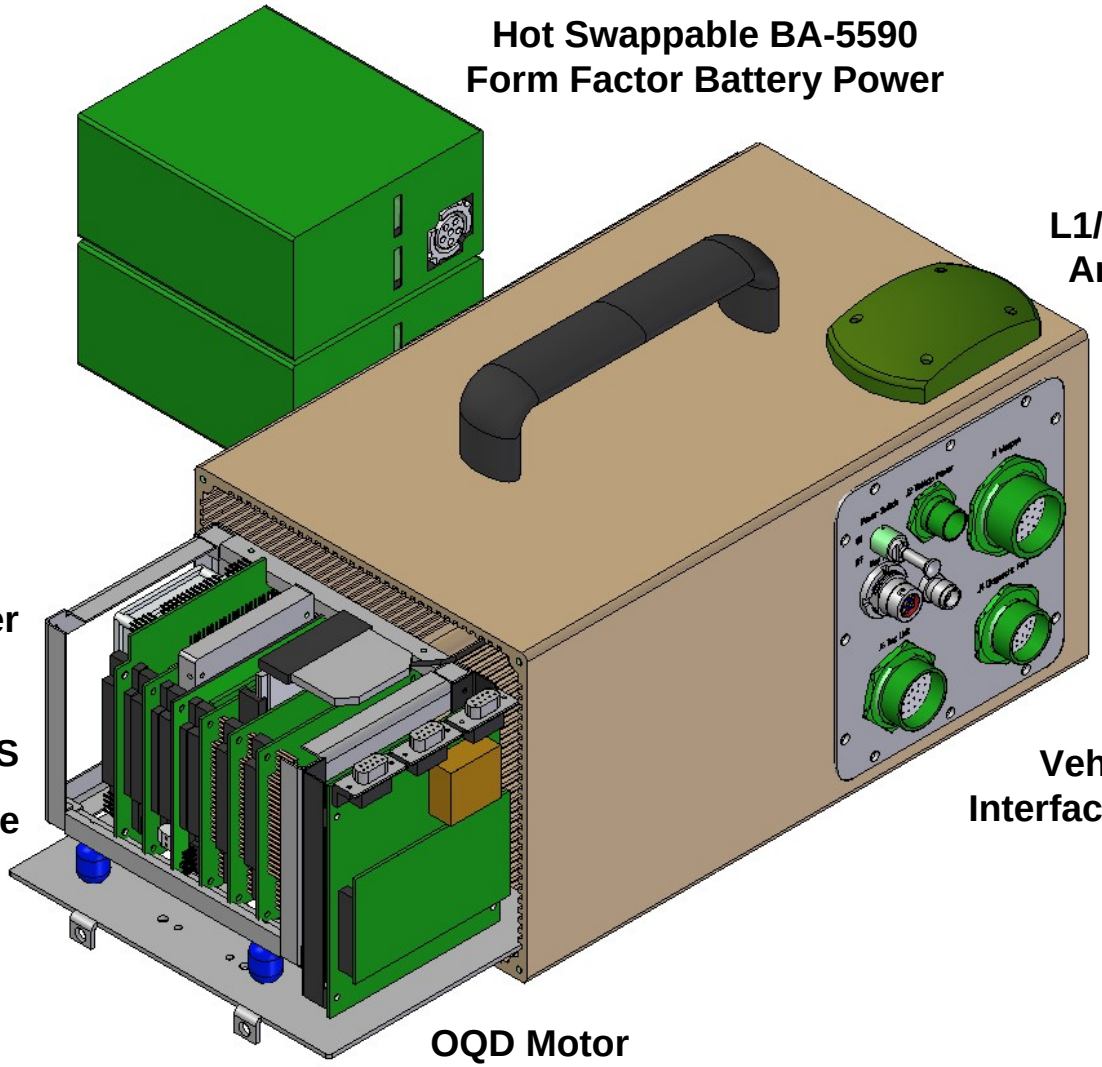
Motorized Direct Fire platform keeps eyes on while engaging targets



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Computing Platform



Hot Swappable BA-5590 Form Factor Battery Power

L1/L2 GPS Antenna

Shock Mounted PC-104 Stack

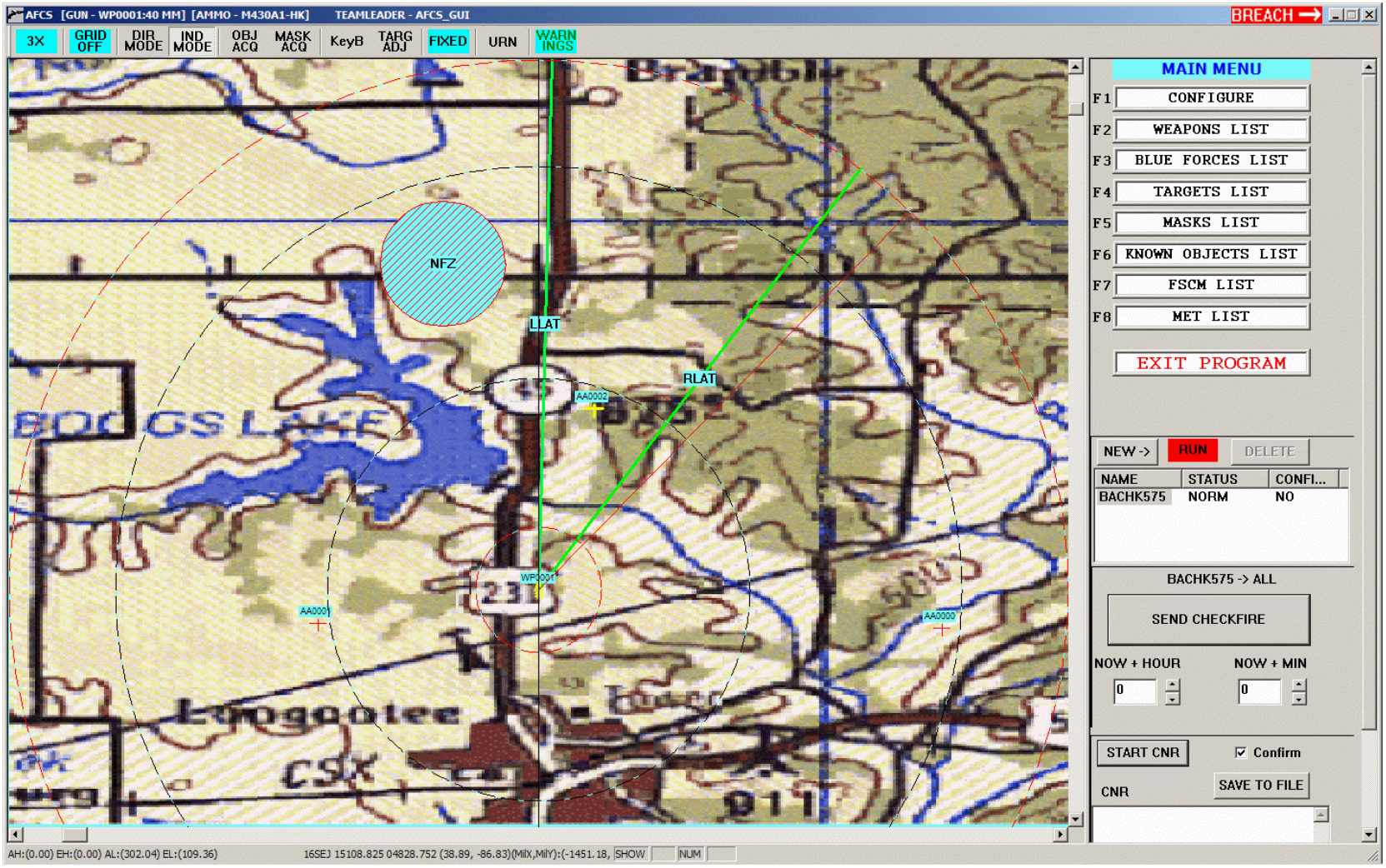
- **Single Board Computer**
- **Solid State Hard Drive**
- **SAASM Compliant GPS**
- **Tactical Radio Interface**
- **8-port Serial Card**

Vehicle Power Interface/Conditioning

OQD Motor Controller

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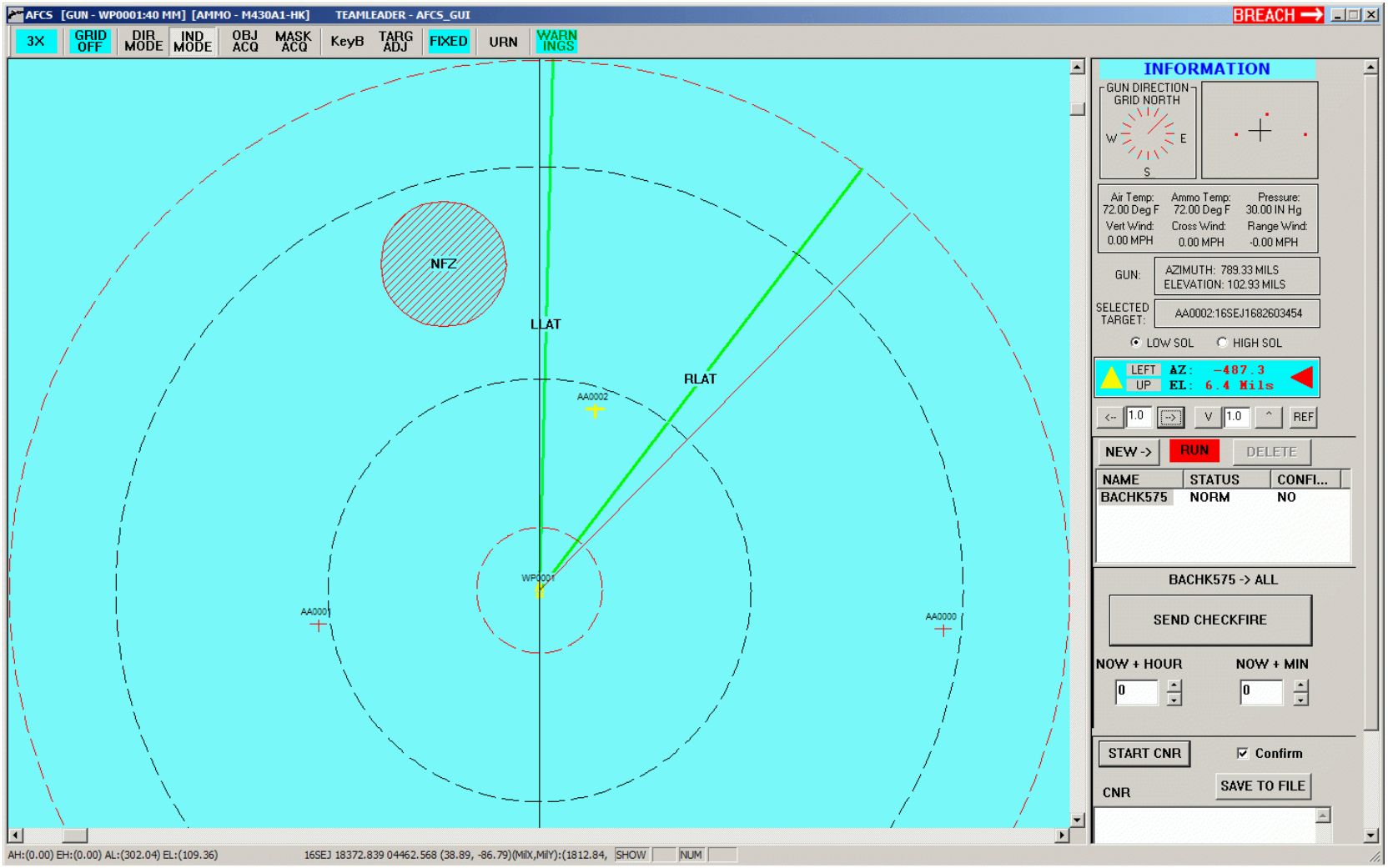
Squad Leaders Display - CJMTK



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Squad Leaders Display - Fixed

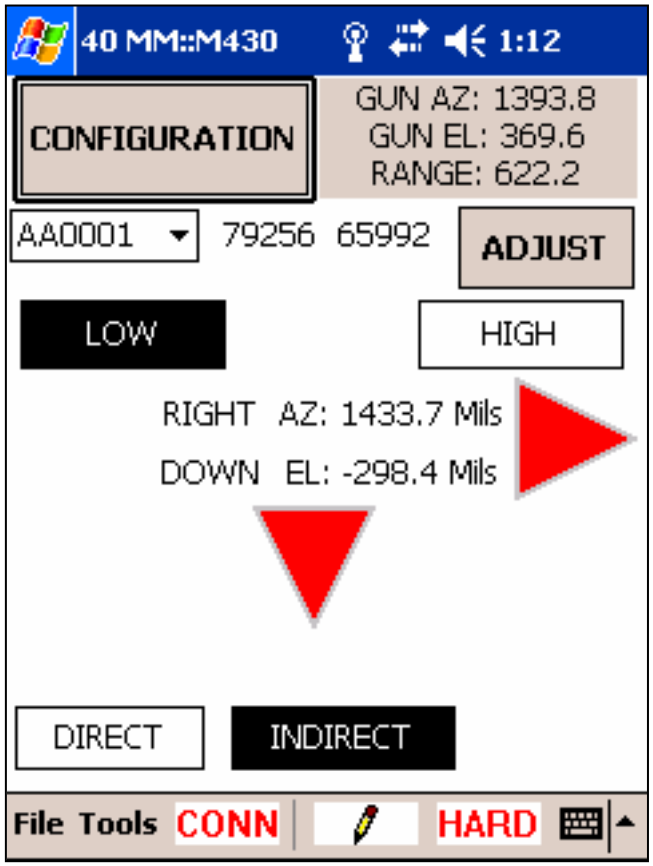


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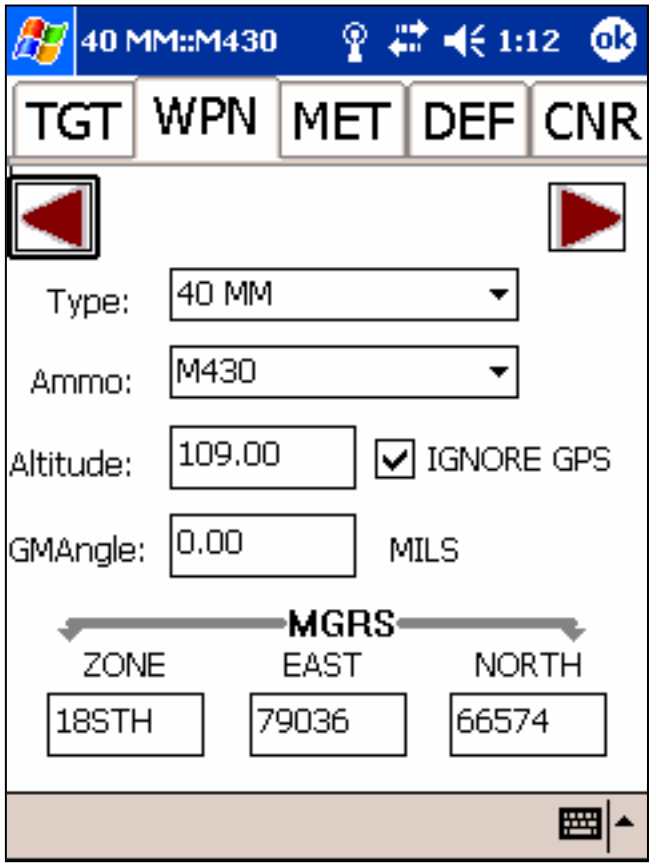
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Gunners Display

Weapon Aiming Cues



System Data Interface



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System Verification Test

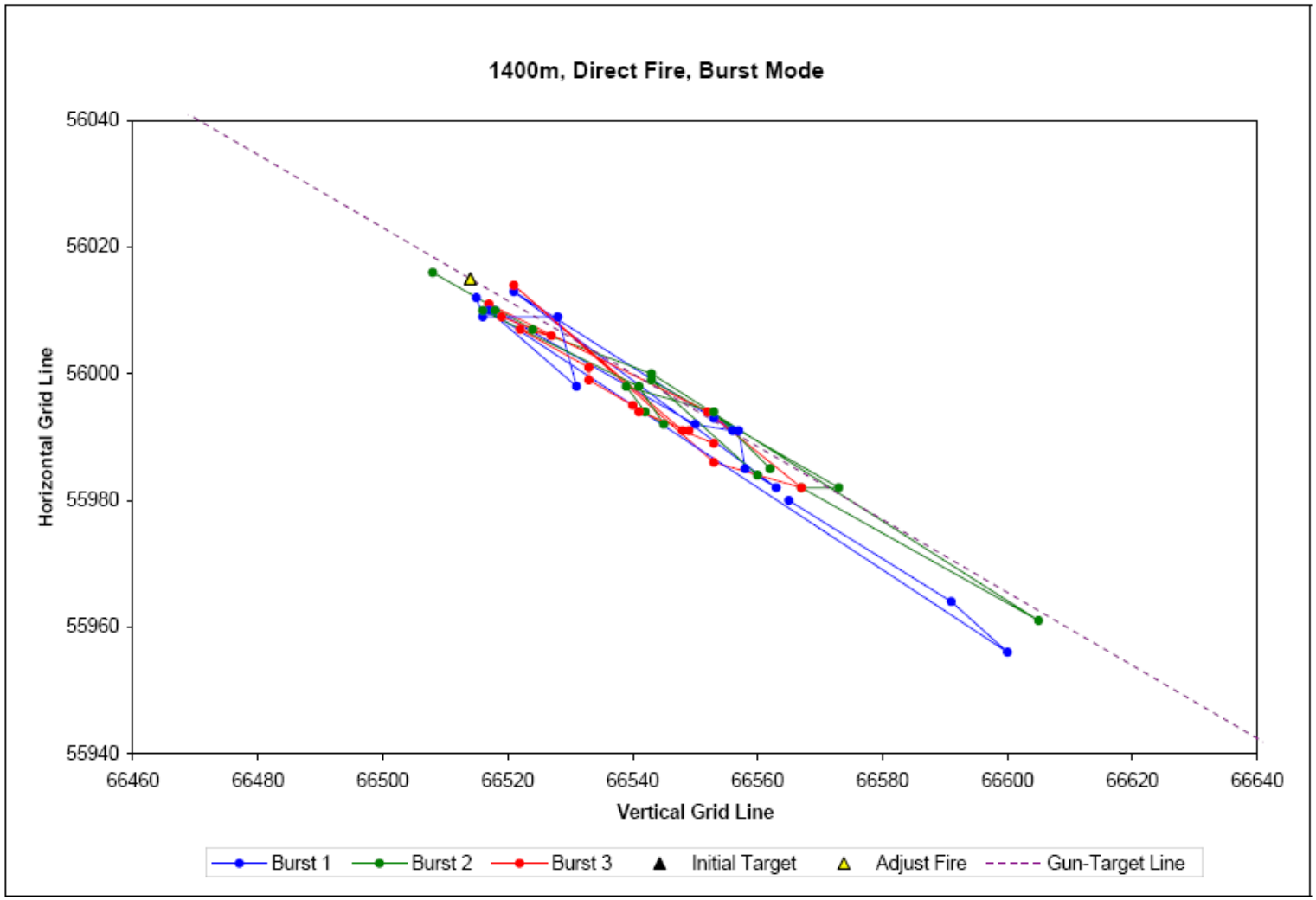
Test conducted by MCPD Fallbrook at Hawthorne, NV in Sept 2006

- Test system performance against TTA exit criteria.
  - 40mm HK GMG and M2HB .50cal
  - Direct Fire and Indirect Fire engagements
  - Low and High QE 40mm
  - Average Radial Error for accuracy
  - CEP for burst fire precision



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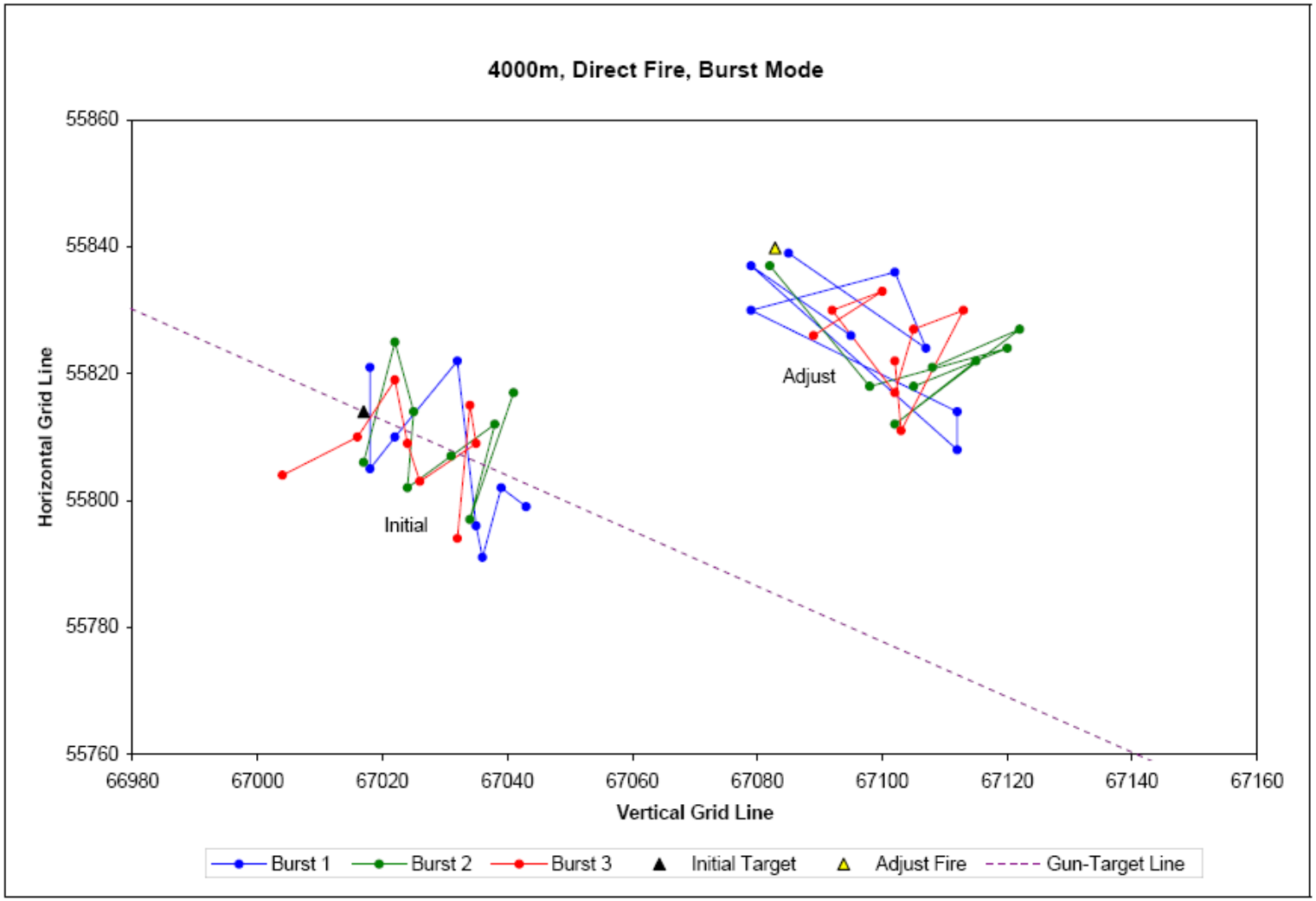
.50 cal Direct Fire @ 1400m



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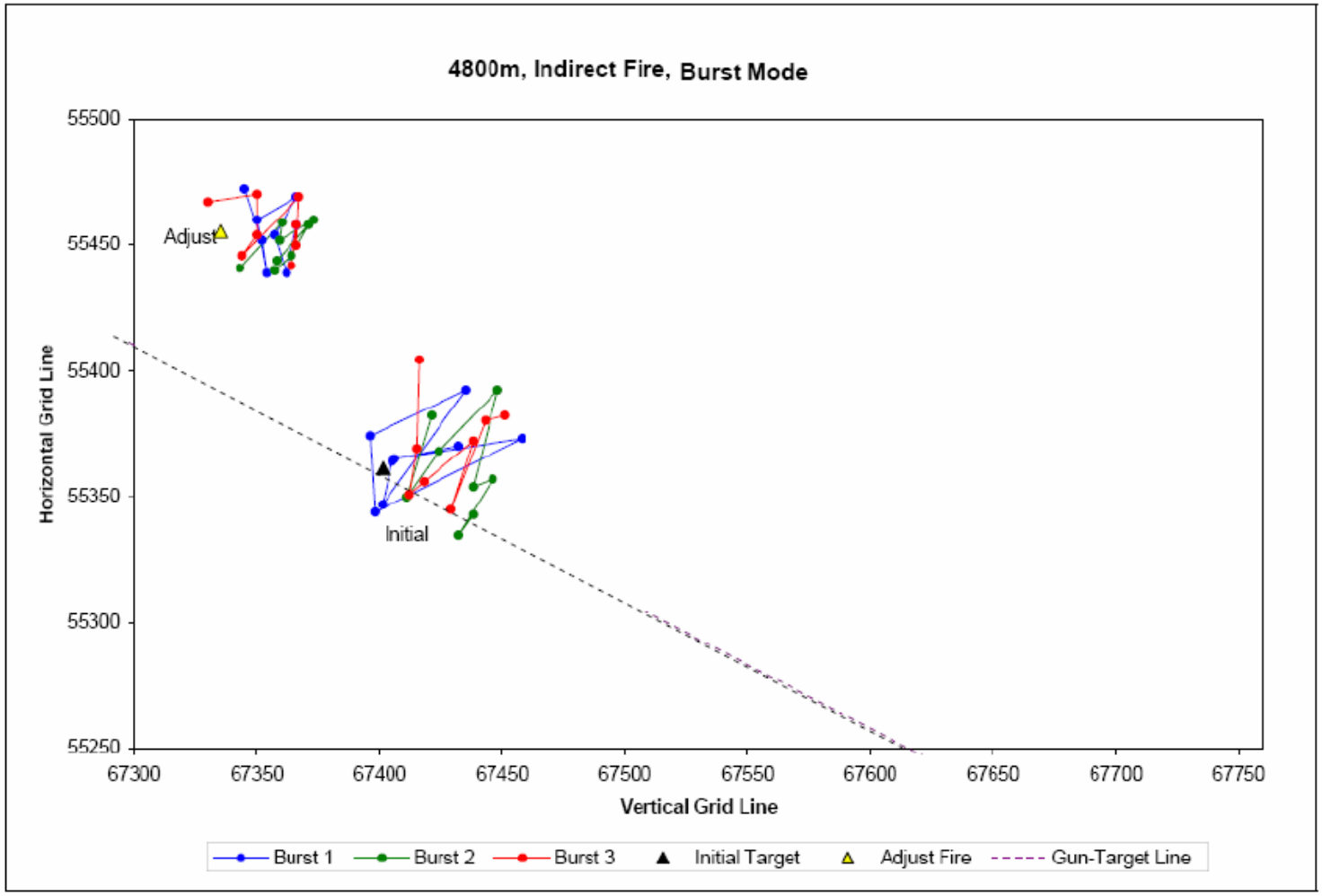
.50 cal Direct Fire @ 4000m



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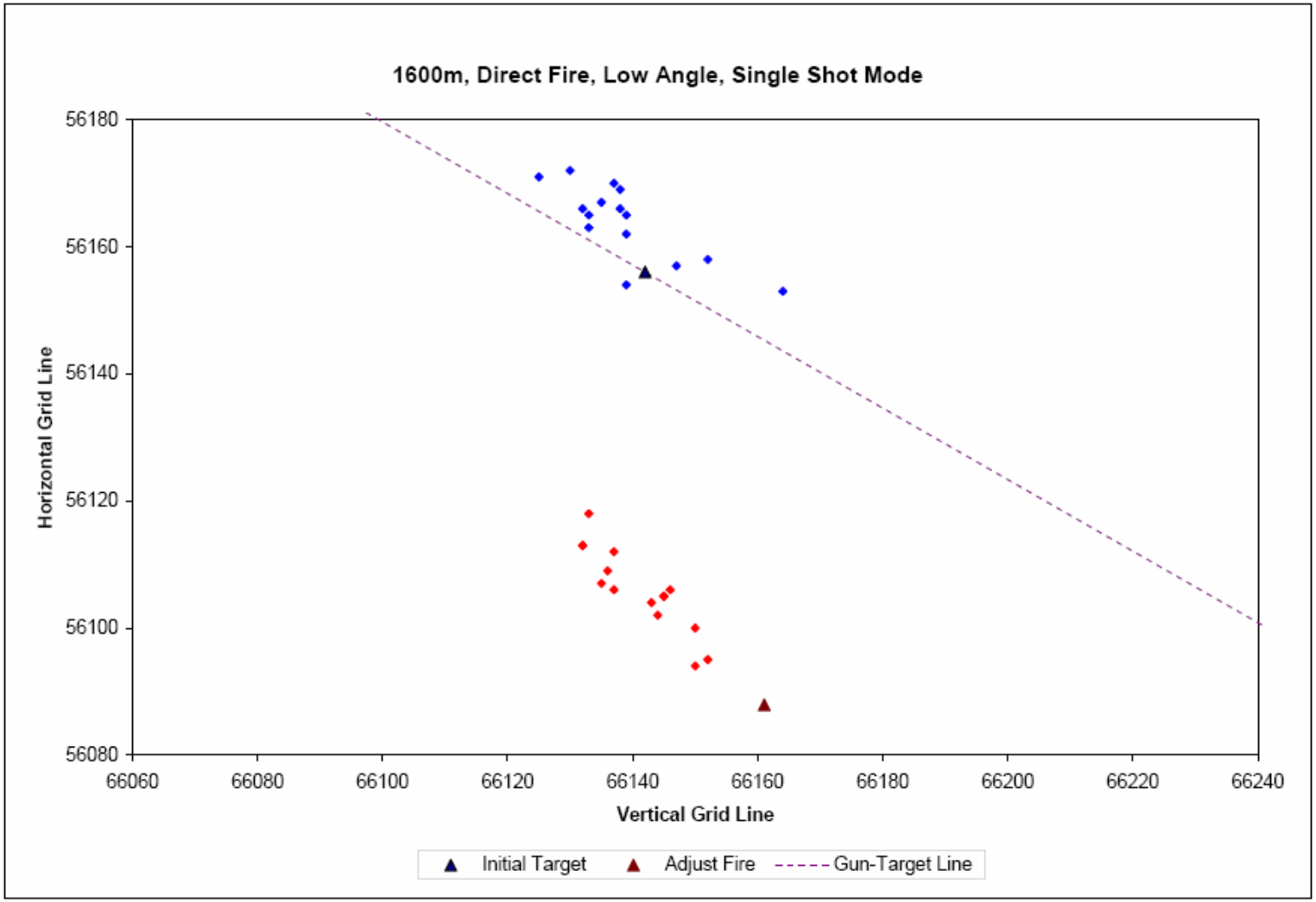
.50 cal Indirect Fire @ 4800m



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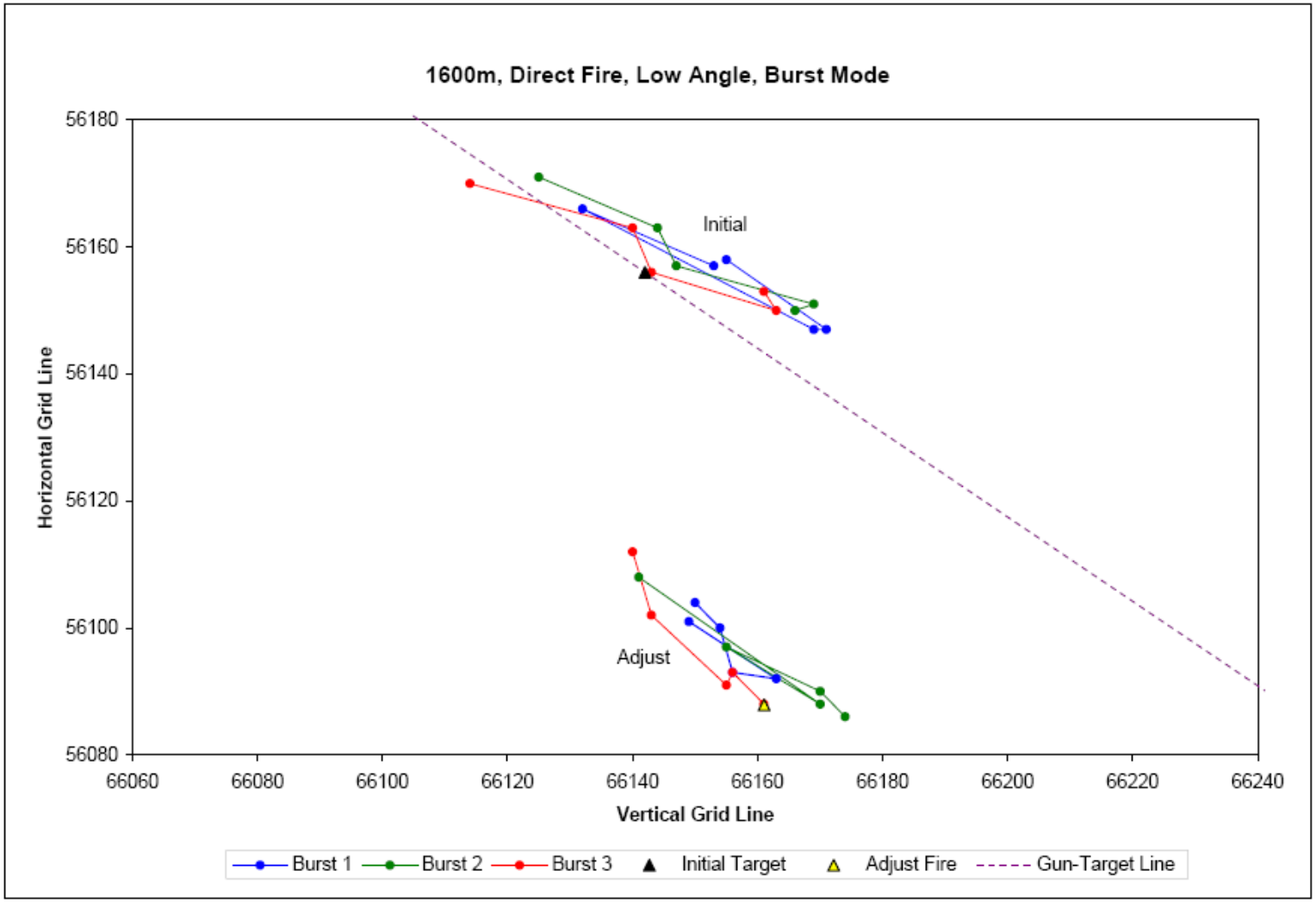
40mm Direct Fire @ 1600m



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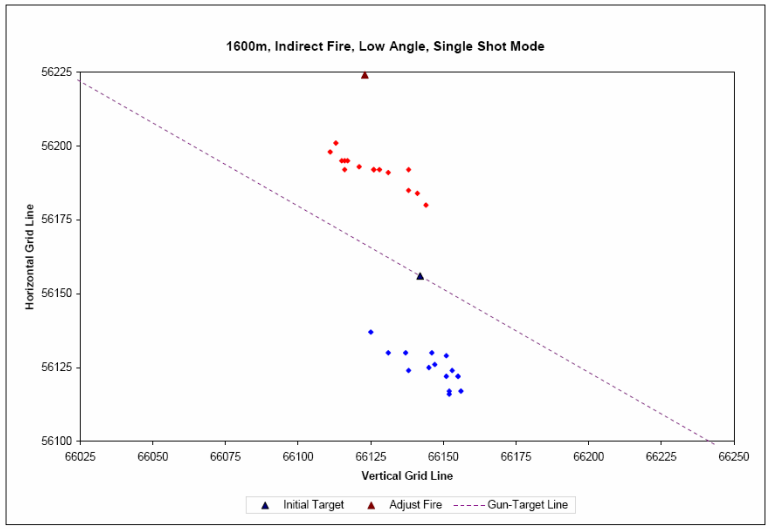
40mm Direct Fire @ 1600m

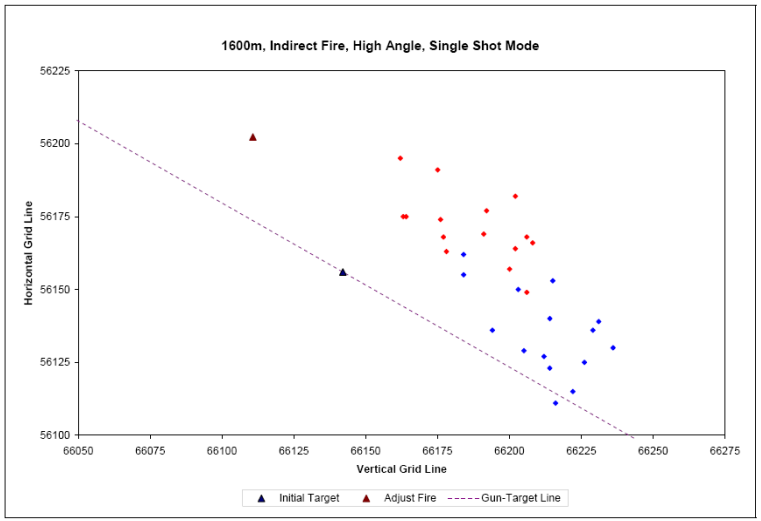


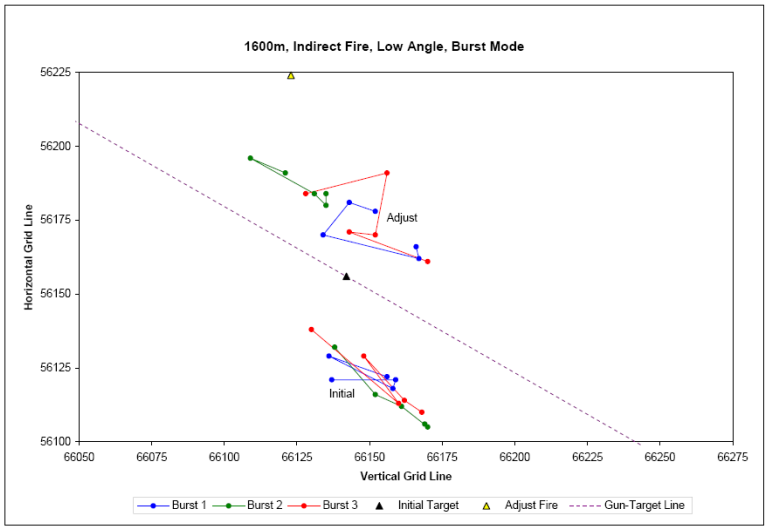
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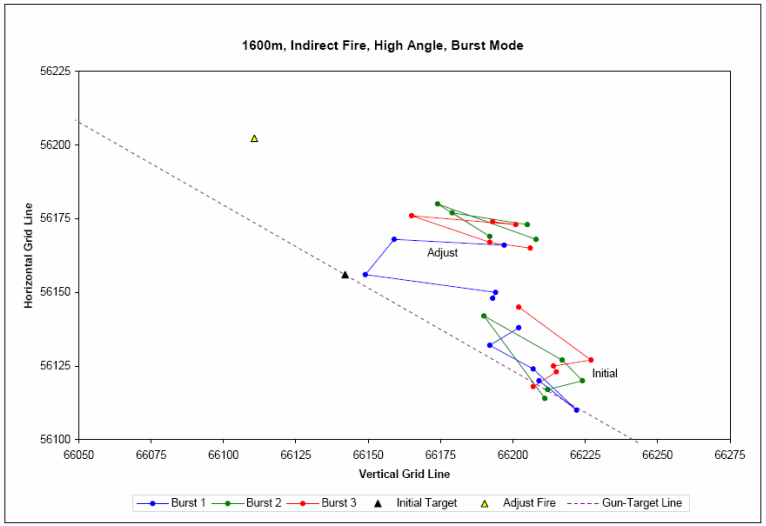
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40mm Indirect Fire @ 1600m









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HMG TTA Exit Criteria

Attribute/Parameter	Current	Threshold	Objective
System Weight	150 lbs – foot mobile with 3 Marines	Shall not increase number of personnel needed to transport weapon	Shall not add more than 10 pounds total to weapon system
Indirect Fire Engagement Time - ground	Greater than 15 minutes	Less than 7 minutes	Less than 2 minutes
Indirect Fire Engagement Time - vehicle	No Capability	Less than 7 minutes	Less than 2 minutes
40mm Indirect Fire Accuracy - first shot	Radial error greater than 200m	Average **radial error < 50m**	Average radial error < 15m
40mm Indirect Fire Accuracy - first adjust	Unknown	Average **radial error < 15m**	Average radial error < 5m
40mm Fire Precision - automatic fire	Unknown	Achieve **CEP < 50 m**	Achieve CEP < 15 m
.50 cal Indirect Fire Accuracy - first burst	No Capability	Achieve **beaten zone impact within 100m** of target	Achieve beaten zone impact within 50m of target
.50 cal Indirect Fire Accuracy - first adjust	No Capability	Achieve **beaten zone impact within 50m** of target	Achieve beaten zone impact on target
.50 cal Direct Fire accuracy on first burst	Unknown	Achieve **beaten zone impact** on target at 75% of weapon's maximum effective range (**1400m**)	Achieve beaten zone impact on target at 110% of weapon's maximum effective range (2000m)
Integrated Fire Control	No automated fire control for indirect fire	Provide onboard fire control using HMG-unique BK	Provide onboard fire control using integrated NABK
Networked Fires Connectivity	Voice only.	External connectivity to higher echelons via JVMF encoded messages	Same as threshold.

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Results Summary



- **Achievable effects on target on initial engagement**
- **Consistent effects on target after first adjustment**
- **Low angle accuracy is better than High angle, but allows for less mask clearance**

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Potential Enhancements

- **Improved inertial sensor**
  - **Smaller/lighter**
  - **Improved accuracy**
  - **Greater shock tolerance**
- **Ammunition improvements**
  - **More consistent muzzle velocity**
  - **Less variance from propellant temp**
- **Wind compensation**
  - **Improved collection of wind data**
  - **Better incorporation of wind data into BK**

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Questions?

For more Information:

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NSWC Crane
joseph.brus@navy.mil
812-854-2314

Capt Mike Vorgang
Marine Corps Warfighting Lab
roland.vorgang@usmc.mil
703-432-0450

Maj Michael Ries
Office of Naval Research
michael.ries@navy.mil
703-696-2572

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Non-toxic Heavy Metal Free Primers for Small Arms Cartridges – Red Phosphorous Based Introducing ATK Lake City's P_4rimer™

Randall Busky; Chemical Engineer, ATK Ammunition Systems

Reed Blau; Development Chemist, ATK Launch Systems

Joel Sandstrom; Chemist; Federal Premium Ammunition, ATK Ammunition Systems

Approved for Public Release

DOD, Reference 07-S-805

23 Feb. 2007



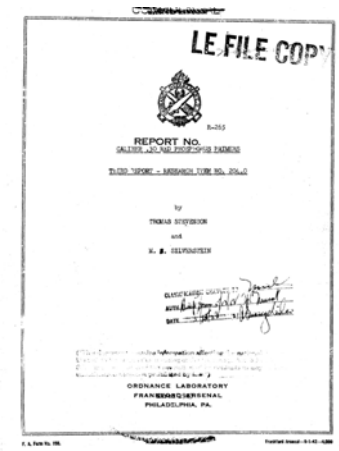
Ignition Mixtures have been ignored

Whereas, a primary initiating explosive is suitable for ignition of small arms propellant, it does not appear to be necessary.

The percussion cap formulations from the 1910 – 50's have more in common with chemical ignition mixtures than primary initiating explosives. Ignition mixtures appeared to have been under-explored as an alternative methodology in the search for an "environmentally friendly primer". A US patent search reveals several ignition mixtures from the 1900 – 1960s assigned for use in percussion caps. This review suggests red phosphorus as a promising candidate.

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DOD, Reference 07-S-805 23 Feb. 07

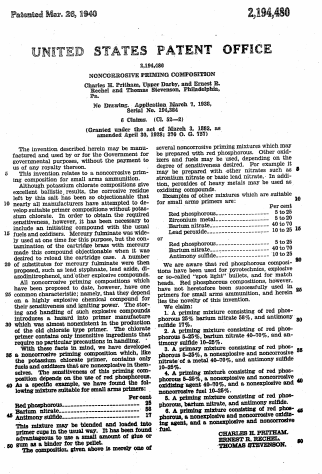
Phosphorous Primers has previous military use


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REPORT No.

ORDNANCE LABORATORY
FRANKFORD ARSENAL
PHILADELPHIA, PA.

Frankford Arsenal's P4 primer – 1940's
Patent #2194480


Patented Mar. 26, 1940 2,194,480

UNITED STATES PATENT OFFICE

NONCORROSIVE PRIMING COMPOSITION

Charles H. Pritham, Upper Darby, and Ernest B. Roehel and Thomas Stevenson, Philadelphia, Pa.

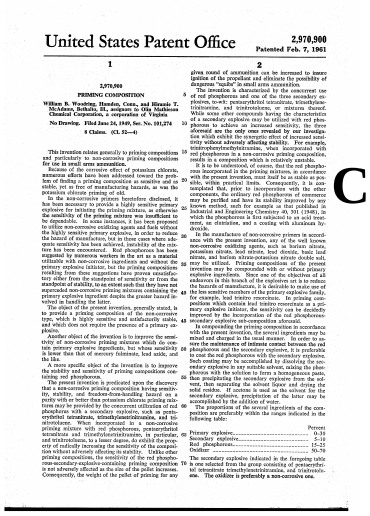
No Drawing. Application March 7, 1938, Serial No. 194,480

6 Claims. (Cl. 52—6)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

Frankford Arsenal's Report Number R-265
Caliber .30 Red Phosphorus Primers
Research Item Number 204.0

Olin's Improvements – 1960's
Patent #2970900


United States Patent Office 2,970,900 Patented Feb. 7, 1961

2,970,900

PRIMING COMPOSITION

William R. Woodring, Hamden, Conn., and Hiranda T. McAdoo, Bothell, Ill., assignors to Olin Mathieson Chemical Corporation, a corporation of Virginia

No Drawing. Filed June 24, 1949, Ser. No. 101,274

8 Claims. (Cl. 52—6)

Clariants' Amorphous P_4 Improvements – 1990's

Clariant

Clariant Technical Bulletins

http://www.nip.clariant.com

ATK Testing – 2005 - 2006

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P4 was considered as the alternative to lead styphnate

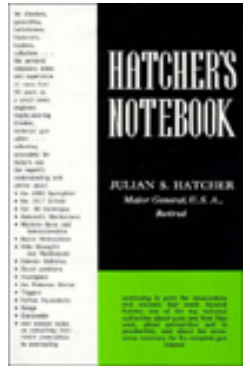
An advanced weapon and space systems company

History of Modern U.S. Military Small Arms Ammunition by Hackley, Woodin & Scranton, 1978



"Through the 1920s, the U.S. experimented with different primers in an attempt to get away from the corrosive compounds of the time. Some of these tests were identified by special headstamps. Additional tests on primers occurred in the 1930s and again after WWII. Some were plated with tin, nickel or zinc but that alone does not automatically mean a primer is an experimental. In the late 1940s, the U.S. used zinc plating to protect primer cups on the then new **P4** primer. "

"**Hatcher's Handbook" by Maj. Gen. Julian Hatcher, 1956;**



"Meanwhile Frankford Arsenal's search for a perfect non-corrosive primer for other service ammunition had been progressing, and they came up with a non-corrosive primer mixture consisting of barium nitrate and red phosphorous, and started its manufacture.

…

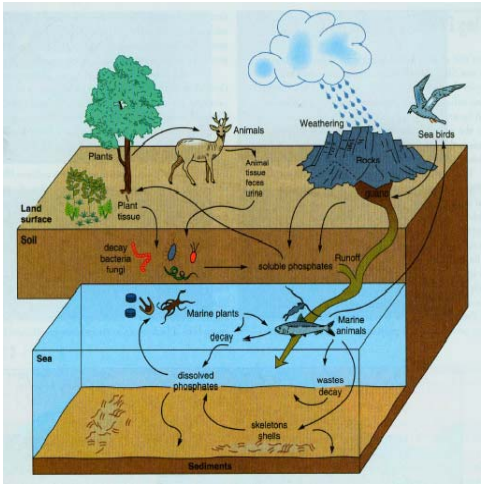
This primer mixture was used for a time (about 1949) with success; but it was finally decided to adopt a lead styphnate primer mixture for all service small arms primers, and such a non-corrosive small arms primer based on lead styphnate was standardized be Ordnance Committee action in August 1949."

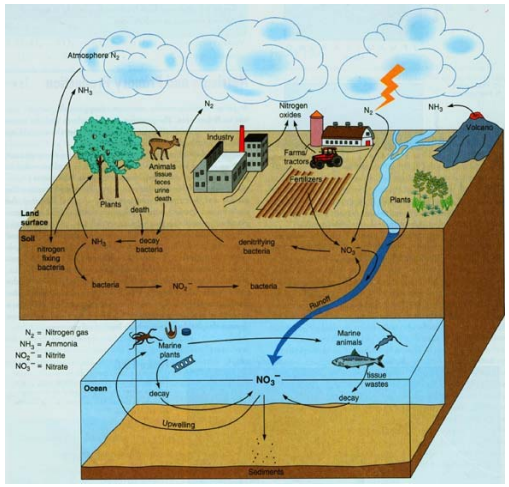
Approved for Public Release
DOD, Reference 07-S-805 23 Feb. 07

Combustion Products are recycled in bio-cycles

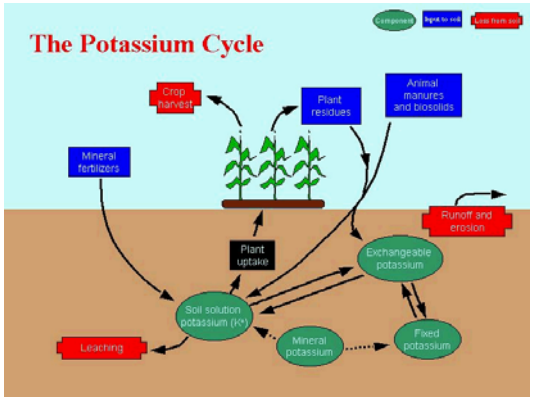
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http://neptune.gsfc.nasa.gov/STAFF/brianc/phospho.html
http://neptune.gsfc.nasa.gov/STAFF/brianc/nitro.html

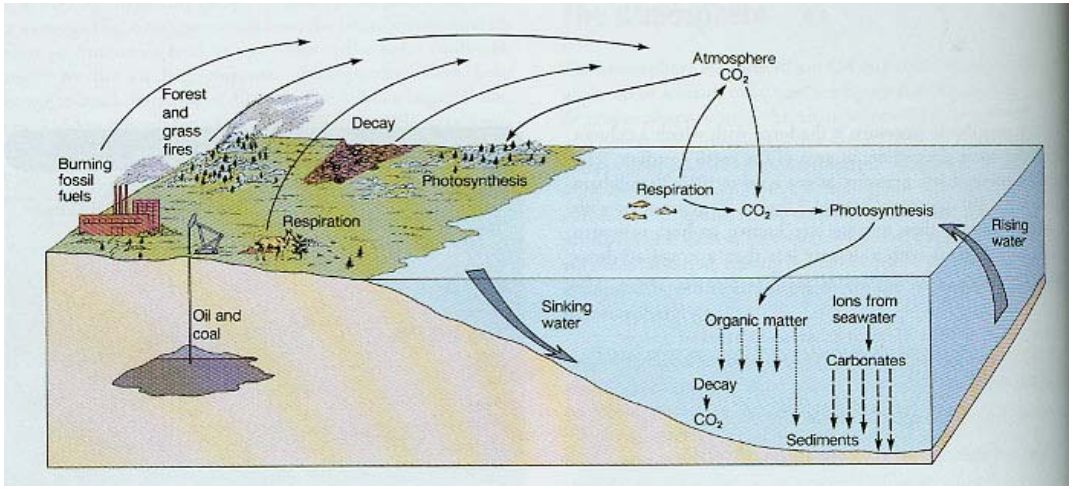




http://www.ppi-far.org/



http://neptune.gsfc.nasa.gov/STAFF/brianc/co2.html



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DOD, Reference 07-S-805 23 Feb. 07

P_4rimer^{TM} Components are Non-Toxic

Elemental Phosphorous is an essential dietary mineral

Recommended Daily Allowance 0.7 g

Tolerable upper intake limit 4 g

Important in Kreb's Cycle

Only certain phosphates salts are biologically absorbed

Elemental Potassium is an essential dietary mineral

Recommended Daily Allowance 4.3 g

Tolerable upper intake limit 15 g

Important in Nerve Impulse function and Metabolic Cycle

Water soluble potassium salts are readily biologically absorbed

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DOD, Reference 07-S-805 23 Feb. 07

P_4rimer™ Combustion Products are "Green"

NASA – Lewis Predicted Mass Fraction after Combustion

Primer Only			
psi	1000	10000	50000
P4O6	36.26	37.86	41.06
K2CO3 (L)	5.27	17.37	19.75
PO2	23.96	17.56	13.41
KOH (L)	0.00	0.00	9.54
K	17.66	9.36	5.70
K2	0.72	1.81	3.53
KOH	13.58	12.77	3.48
KO	2.02	1.35	1.65
PO	0.53	1.73	1.59
PN	0.01	0.17	0.27
KH	0.00	0.03	0.01

1:16 Primer: Gun Prop.			
psi	1000	10000	50000
KOH	32.66	39.56	46.11
PO2	42.83	41.41	33.96
PO	12.32	11.83	9.66
PN	0.90	2.36	3.91
P4O6	0.00	0.17	3.63
K	10.86	4.29	2.26
KH	0.17	0.21	0.28
KO	0.26	0.13	0.09
PH	0.00	0.04	0.05
KCN	0.00	0.00	0.05

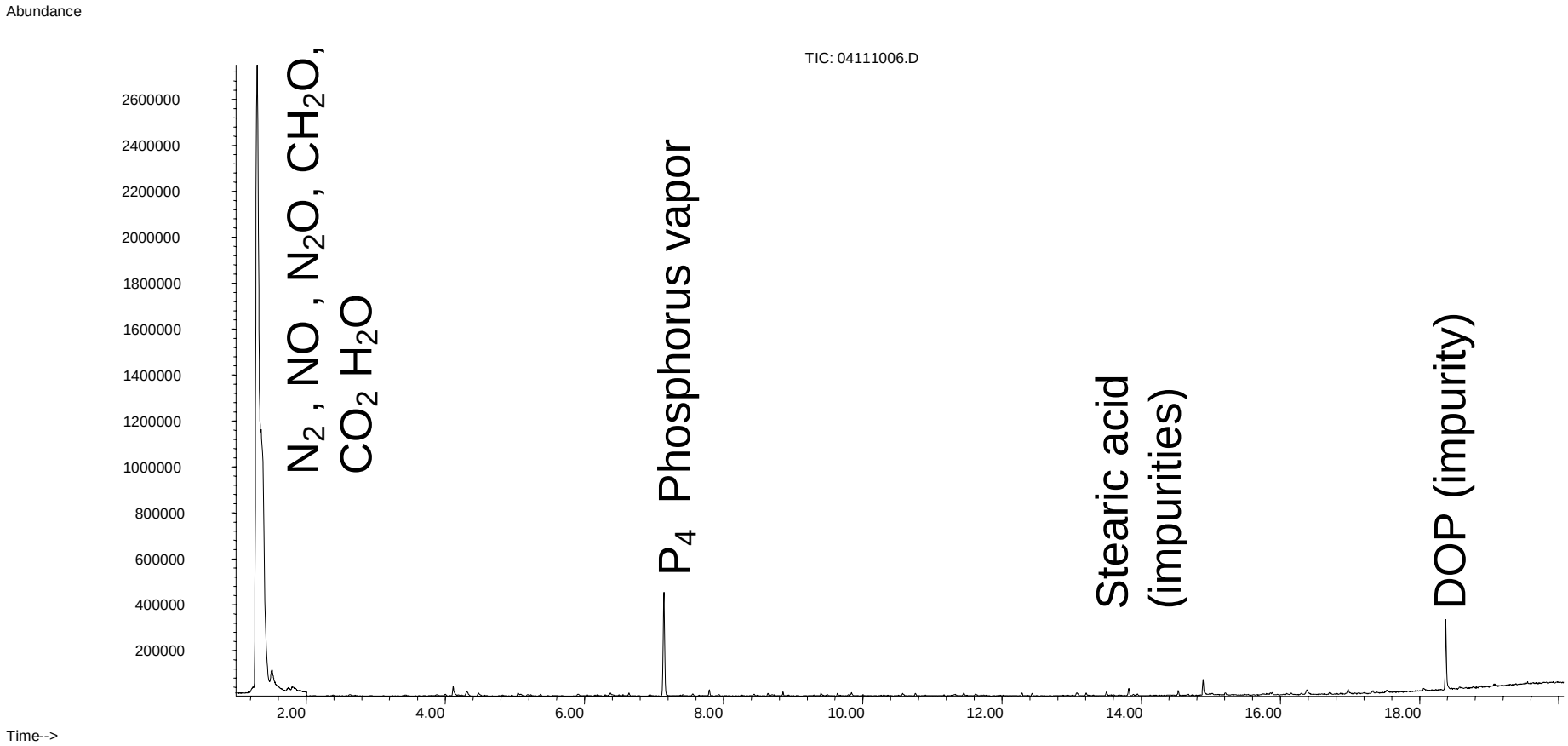
Main combustion components are chemical pre-cursors for agricultural fertilizer

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Pyrolysis GC / MS confirms NL Code Products

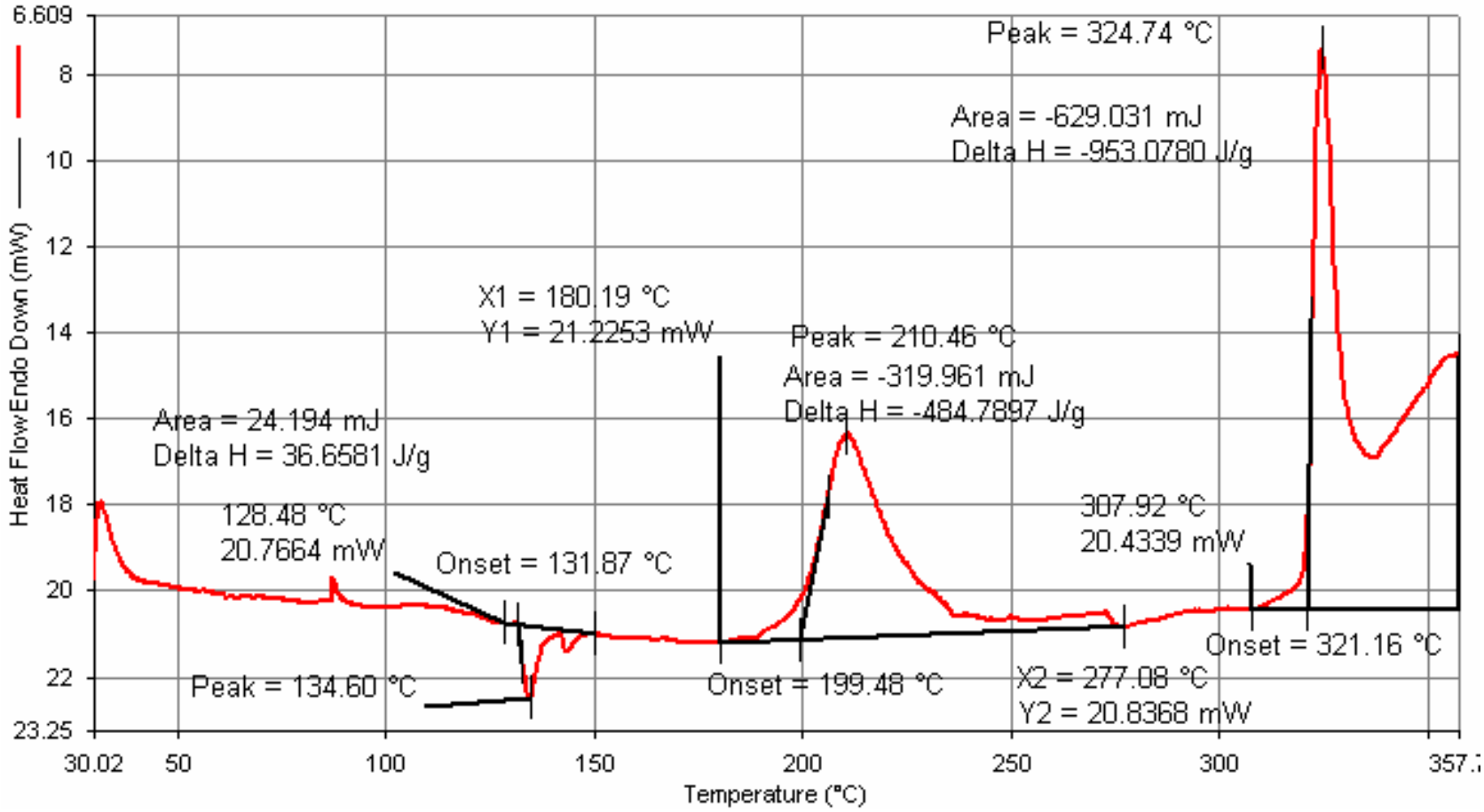
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Total Ion Chromatogram from PyGC/MS Analysis of P_4rimer™



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P_4rimer™ has many exo-therms for good ignition



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P_4rimer^{TM} is more thermally stable than FA956

Modified Vacuum Thermal Stability:

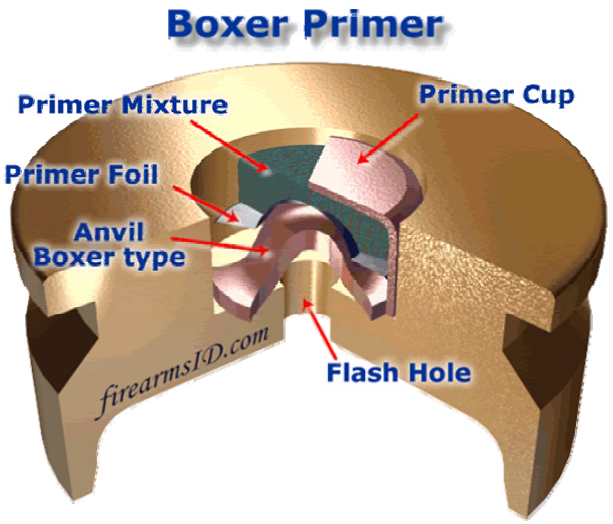
Mil Std 1751A Method 1063 at equal mass

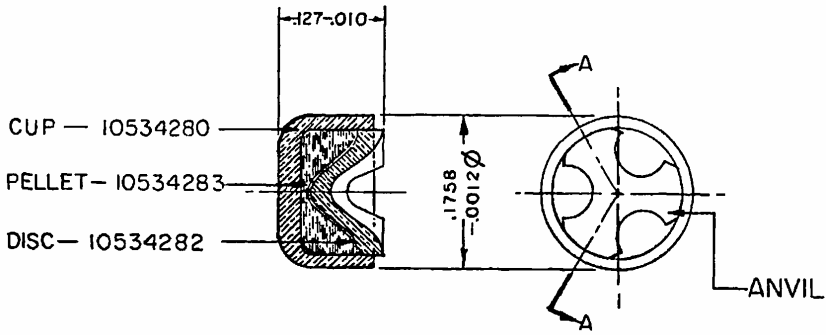
Frankford Arsenal Formula 956 – 0.375 ml gas

P4rimerTM – 0.125 ml gas

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Primer Design Does Not Change with P_4rimer™





Engineering Constraints

- Non-Toxic
- Stable
- Cost effective

Ingredients

Light Metal Nitrates

Encapsulated Red Phosphorus

Secondary Explosive

Light Metal

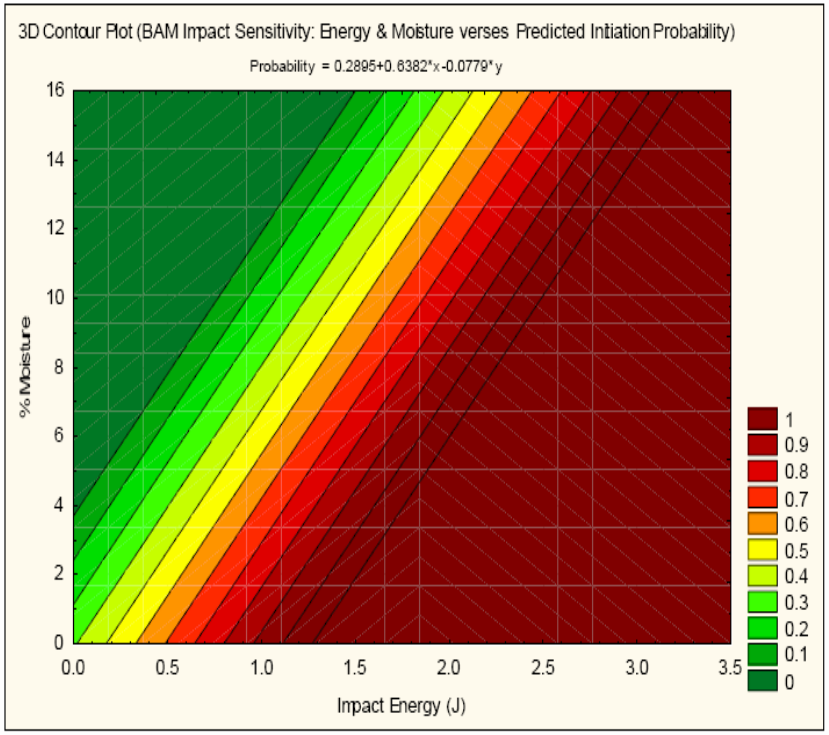
Binder

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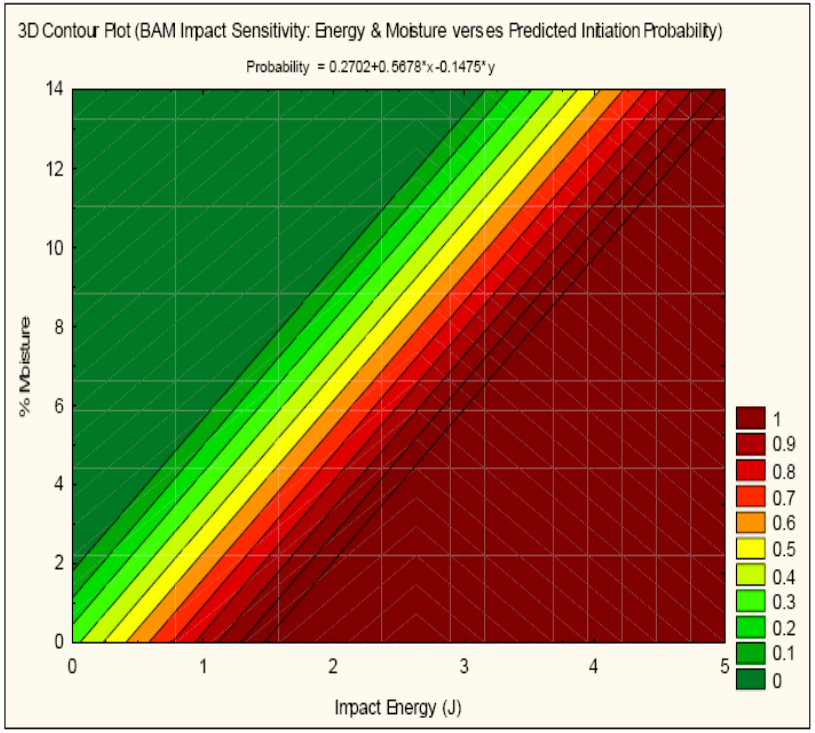
P_4rimer™ has the same mechanical activation energy

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BAM Impact Ignition Probability for ATK P4



BAM Impact Ignition Probability for FA 956



as functions of Energy and Moisture

Impact ignition for P4rimerTM and FA 956 are very similar.

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P_4rimer™ is a viable substitute for Pb Styph formulations

- Can be used in current primer, case, cartridge metal parts
- Same Impact energy
- Meets Percussion Cap performance paragraphs of Military Specification MIL-P-46610E (MU)

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P_4rimer™ is a truly "Green" Primer

- **P_4rimer™ is a Non-corrosive, "Green", Non-Toxic, Heavy Metal Free Ignition Mix**

  - Non-corrosive as tested in "Frankford Arsenal's Report Number R-265 Caliber .30 Red Phosphorus Primers Research Item Number 204.0"
  - Meets requirements for Section 5 of the US Federal Trade Commission Act; Federal Trade Commission Guides for the Use of Environmental Marketing Claims, Part 260 and US Environmental Protection Agency in publication EPA 260-B-01-001 as applied to the terms; "green", "heavy metal free" and "non-toxic"
  - Mix Chemicals and Combustion Products are chemical pre-cursors for agricultural fertilizer
  - Uses Biologically tolerant and recyclable chemicals

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P_4rimer™ is being assessed by the US Army

ATK P_4rimer™ Milestones:

1) US Patent Application, March 2006

2) US Army Feasibility Study

Contract DAAA09-99-D-0016/0012, Mod 7;
July 2006

3) EU Patent Application, February 2007

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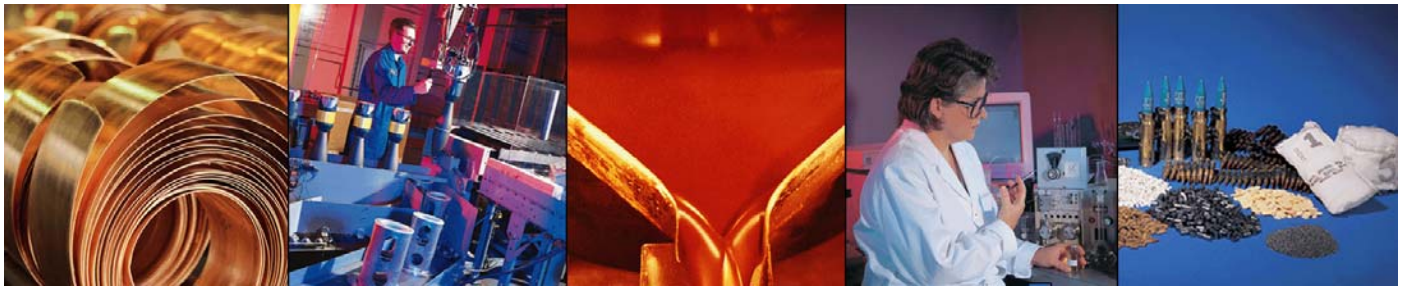
US Army Points of Contact – Feasibility Study

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PM-MAS – Jim McGrath
ARDEC – Lucas Lopez
ARL – Paul Conroy

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GENERAL DYNAMICS
Ordnance and Tactical Systems



SIMUNITION®

2007 George M. Chinn Award Winner
Bill Dittrich

May 8, 2007
Brian Berger

Chinn Award Criterion

- **“The George M. Chinn Award is presented annually to honor a government or industry individual who, in the opinion of the Small Arms Systems Division Executive Board, has made significant contributions to the field of small arms and / or infantry weapons.”**

Bill Dittrich Professional Experience

- **Employee at Frankford Arsenal from 1954-1977 (23 years)**
- **Professional Experience at Frankford Arsenal**
  - Establishment of computer simulation laboratory (1954 - 1955)
  - Chief of Section responsible for ballistic measurement of small arms ammunition, cartridge activated devices, recoilless rifles, explosives and related systems (1956 -1963)
  - Team Leader of project to develop and produce special weapons, ammunition and related devices for US Special Forces to include silenced or suppressed weapons, special shotguns, propellant / explosives and fire control devices (1964 – 1969)

Bill Dittrich Professional Experience

- **Professional Experience at Frankford Arsenal**
  - Chief Engineer of the Small Caliber Ammunition Program (SCAMP), the Army's first major program in the automation of ammunition production, which was installed at LCAAP in the early 1970's. (1969 – 1977)
- **Professional Experience at Picatinny Arsenal**
  - Chief of Manufacturing Technology at ARDEC (1977 – 1985)
  - Development of new manufacturing processes and equipment for small caliber weapons, ammunition, propellants / explosives and fire control devices.
- **President of Fleximation – (1985 – present)**
  - Bill retired and formed a consulting business called Fleximation, Inc.
  - Services related to R&D, manufacture, test and failure analysis of small caliber weapons, ammunition and demolitions systems
  - Clients have included the US Army, General Dynamics – Canada (SNC TEC), Saco Defense, Olin / Winchester Corp, US Treasury, Dept of Energy and others.

Bill Dittrich Professional Experience

- **Patents**
  - Multistage Weapons, Laser Exciter, Vibration Transducers, Composite Gun Barrels, Non Lethal Ammunition (FX Marking Cartridge Family of Munitions)
- **Publications**
  - Numerous Technical Reports on small arms weapons and ammunition, training manuals on improvised munitions, explosives and special weapons
- **Memberships**
  - National Defense Industrial Association, AUSA, Society of Manufacturing Engineers, Sigma XI, NRA

Bill Dittrich Career Highlights

- **Weapons**
  - Worked on designs for microballistic weapons 1, 2, & 4mm
  - Worked on designs for wire guns, laser guns, disposable 21 shot electric fired pistol, CABWS (400+ shot electric fired .22 weapons
  - Worked on designs for 12 ga. Automatic shotgun and semi automatic .50 cal sniper rifle
  - Evaluation of special designs of submachine guns and weapons silencers for use by Special Forces

- **Ammunition**
  - Teamed with GD-OTS Canada for NSAC Project for LWCC -7.62/5.56mm
  - Conceived the FX Marking Cartridge Projectile design and licensed the rights to SNC TEC, currently in use throughout DoD and in **43** countries around the world.
  - Worked on a design for Silent Ammunition
  - Worked with SNC TEC to design .50 cal limited range, 7.62 short range, plated .50 cal bullets, explosively propelled projectiles

Bill Dittrich Career Highlights

- **Ballistic Instrumentation Design Work**
  - Strain Gauging of barrels for internal pressure studies
  - Accelerometers in projectiles to measure actual projectile acceleration
  - Bore surface thermocouples with fast response to measure gas temperature / time during a ballistic cycle
  - Microwave measurement of projectile velocity / position and tracer performance in flight
  - Special transducers, electronic circuitry and computers for instrumentation / data reduction
  - Patent on first Piezo Transducer incorporating a field effect transducer impedance converter
  - Development of a machine for testing of primer output

Bill Dittrich Career Highlights

- **Equipment Design Work**
  - Assigned in 1970 while at Frankford Arsenal as Chief Engineer of the SCAMP Program. SCAMP machines still in use at LCAAP.
  - Helped lay out the entire program and prepare scopes of work for the original equipment manufacturers.
  - Helped develop novel manufacturing process, machines, inspection equipment / computer process control including:
    - 100% in-line inspection of case hardness, grain size, bullet weight, x-ray of powder level, tracer intensity, etc.
    - Use of vibration and ultrasonic signatures to detect bad parts
    - Skewed axis roll forming of bullets
    - Alternate parts feeder concepts, high speed component transfer
    - Computer studies to optimize line efficiencies, repair and downtimes

Bill Dittrich Career highlights

- **Miscellaneous Project Work**
  - M16 Failure Analysis in Vietnam
  - Work on aluminum and steel cartridge cases
  - Demolition devices including blasting battery, 2-part safe blasting cap, modular electronic triggering system
  - Part of a special project management office at F/A to study barrier / counter barrier R&D.
  - Participant in Project Greenball, supplying weapons and training to the US Secret Service White House Detail
  - Special processes for micro rifle barrel manufacture
  - Thermite devices and metal embrittlement
  - 20mm manufacturing line, including 600 ppm HE charging, fuze manufacture, steel case production, load / assembly

Summary - Bill Dittrich

- **Bill Dittrich has devoted 50+ years to making significant contributions to the field of small arms, ammunition, propellant, automation of mfg equipment, etc.**
- **$0 - Contract will ARDEC to mentor young engineers. Bill is actively working with young engineers mentoring them and sharing his knowledge with them to better prepare them for serving the US Army in the future**
- **He starts each day thinking of ways to improve the equipment in the hands of our soldiers**
- **Even at the age of (70 plus) he is still active, currently teamed with GD-OTS Canada NSAC project to develop lightweight cartridge cases (7.62 / 5.56mm) which will reduce the weight of the ammo by 20%**
- **Bill Dittrich's life-long commitment to Small Arms is evident and he continues to contribute significant achievements and therefore he is a deserving recipient of the 2007 Chinn Award**

The Soldier: America's Most Deployed Combat System

PM Individual Weapons Overview

for the

Small Arms Symposium & Exhibition

National Defense Industrial Association

7-10 May 2007

LTC Tim Chyma
Product Manager Individual Weapons
(973) 724-4695
tchyma@pica.army.mil

Individual Weapons



















XM25 Air Burst Weapon System

Description:

A semi-automatic rifle with an integrated target acquisition fire control that fires 25mm air bursting munitions.

ACQ STRAT: Developmental

QTY: TBD

Phase: Technology Development

Contractor: Alliant Techsystems, Plymouth, MN; L3 Communications (Brashears), Pittsburgh, PA; H&K, Oberndorf, GM



Capabilities:

- **Defeats defilade targets**
- **Family of 25mm ammunition**
  (includes HEAB, TP, AP, non-lethal)
- **500 meter point targets**
- **500-700 meters area targets**
- **Fully integrated target acquisition/fire control**
  (2x Thermal, 2x DVO, LRF, compass, fuze setter, ballistic processor, and internal display)

Future Key Events:

- **Design Refinement (system weight reduction, fuze, TA/FCS interface)**
- **Engineering testing**

XM26 Modular Accessory Shotgun System (MASS)

Description:

A lightweight accessory shotgun system that attaches under the barrel of the M4 and M16 Modular Weapon Systems.

ACQ STRAT: COTS/NDI

Qty: Tentatively 26,789

Phase: Low Rate Initial Production

Contractor: Vertu Corp



Capabilities:

- **Fires Lethal, Non-lethal and Door Breaching 12 Ga. Rounds**
- **Can be zeroed to the sighting system of the host weapon**
- **Lethality equivalent of a stand-alone 12 Ga. Shotgun**
- **Can be fired as a stand-alone weapon**

Future Key Events:

- **Production Qualification Testing**
- **Operational Testing**
- **Production Decision**
- **Fielding**

XM320 GRENADE LAUNCHER MODULE (GLM)

Description:

A 40mm grenade-launching weapon module that will replace M203 series grenade launchers currently mounted on the M16/M4 series of rifles and carbines.

ACQ STRAT: COTS/NDI

Qty: Tentatively 71,600

Phase: Systems Dev & Dem

Contractor: Heckler & Koch Defense Inc.





Capabilities:

- **Integral Day/Night sighting system improves target acquisition and accuracy**
- **Improved Reliability and Safety**
- **Can be fired as a stand-alone weapon**
- **Unrestricted breach allows a wider array of munitions**

Future Key Events:

- **Production Qualification Testing**
- **Operational Testing**
- **Production Decision**
- **Fielding**

XM150
Rifle Combat Optic (RCO)

Description:

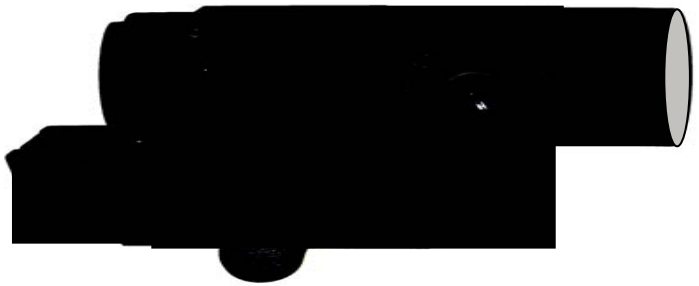
A magnified optic that attaches to M4s, M16s and M249s to improve the ability to recognize and engage targets out to 600m.

ACQ STRAT: COTS/NDI

Qty: Tentatively 135,091

Phase: System Development & Demonstration

Contractor: TBD



Capabilities:

- **Improved capability to recognize and engage targets 0-600m.**
- **Allow Soldier to rapidly transition between close quarter and long-range engagements.**

Future Key Events:

- **Full & Open Competition**
- **Bid Sample Testing**
- **Contract Award**
- **DT/OT Testing**
- **Full Rate Production Decision**

M68
Close Combat Optic (CCO)

Description:

A unity powered red dot sight that attaches to M4s and M16s for close quarter engagements.



ACQ STRAT: COTS/NDI

Qty: Tentatively ?

Phase: Production (Recompete)

Contractor: TBD

Capabilities:

- **Allows the Soldier to engage targets with both eyes open while maintaining situational awareness**
- **Eliminates the difficulty associated with aligning irons sights.**

Future Key Events:

- **Full & Open Competition pending approval of Acquisition Plan**
- **Bid Sample Testing**
- **Contract Award**
- **DT/OT Testing**
- **Full Rate Production Decision**

Emerging Requirements/Programs

Emerging Requirements

- Handgun / Pistol
- Personal Defense Weapon
- Family of Weapons

Pending outcome of the USAIC Capabilities Based Assessment

Expected Acquisition Approach

- COTS / NDI
- Full and Open Competition


"Every Soldier is a Rifleman First"
GEN Schoomaker

FCS SDD-449 Close Combat Armament System (CCAS) Trade Study – Performance Assessment

Briefer Name: Andrew Clark

Date: 9 May 2007

Approved for Public Release; Distribution is Unlimited

Andrew Clark
IWARS Contact
410-278-6631
andrew.b.clark@us.army.mil

Lew Farkas
Weapon Performance
410-278-2724
lew.farkas@us.army.mil

Background

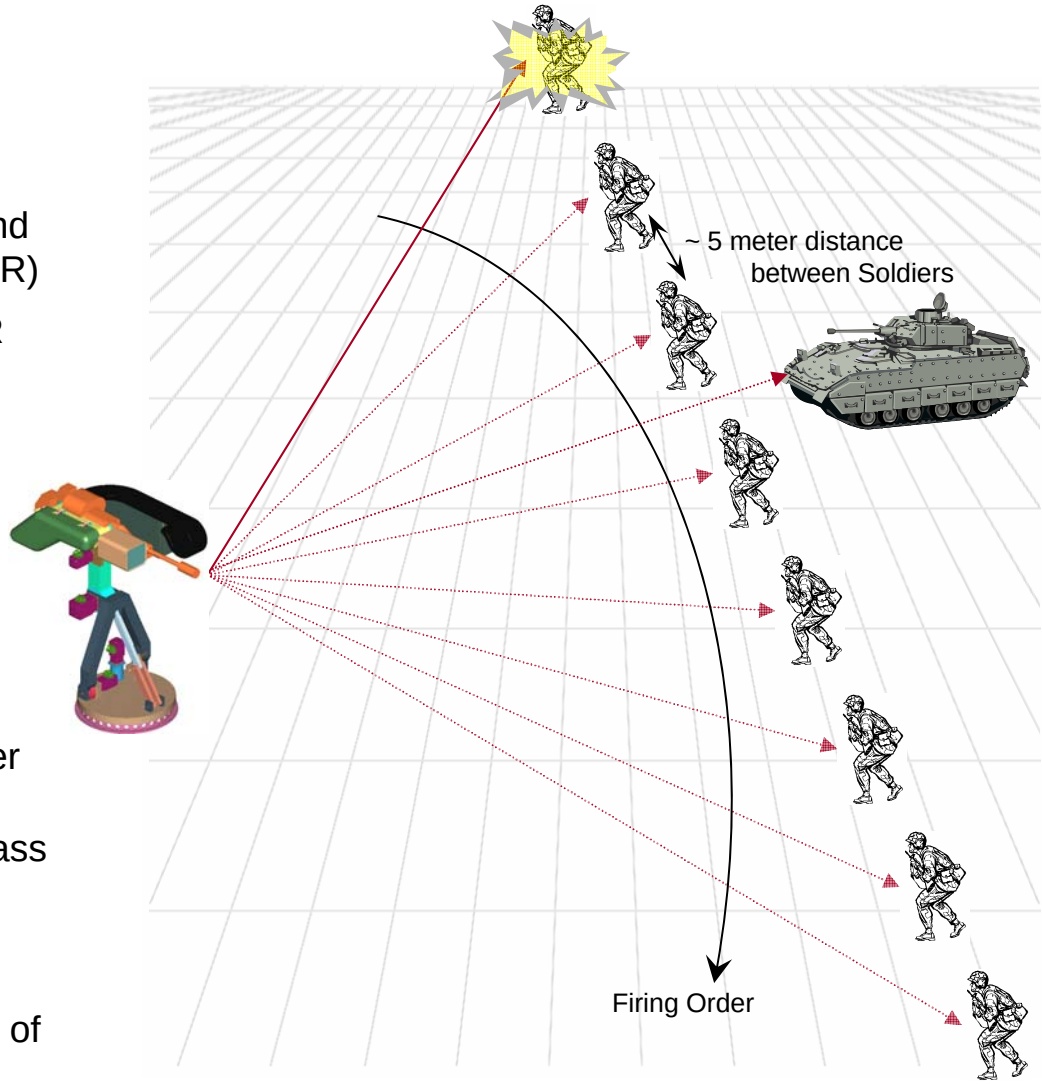
- Budget pressures on both the FCS CCAS weapon and weapon station programs necessitated looking for either Non-Development Item (NDI) or nearly NDI solutions for both the weapon and weapon station – SDD-449 Trade Study was Conducted

- AMSAA used the FBAR model to conduct a performance assessment of select weapon and ammunition systems in support of the SDD-449 Trade Study

- IWARS used to replicate a subset of the CCAS study in order to verify IWARS results consistent with established methodology

Study Scenario

- OPFOR Targets
  - Personnel: 8 man squad
    - Initial posture standing
    - All OPFOR go prone after first round fired (regardless of targeted OPFOR)
    - OPFOR does not return fire (FBAR only plays one sided engagement)
  - Materiel: BTR (Soviet Light Armored Vehicle)
- Terrain: Tabletop
- Candidate Weapon/Munitions mounted on Combat Vehicle
- Engagement Process
  - Aimpoint for bursting munition is 1 meter above target
  - Aimpoint for kinetic rounds center of mass
  - Targets OPFOR on far left first
  - Fires one burst per target
  - Subsequent burst fired at target to right of current target (personnel only)



CCAS Weapon Alternatives and Characteristics

Weapon & Fire Control Basis

- **Remote weapon station**
- **Single or dual feed**
- **Stabilized gun & sight**
- **360 deg traverse**
- **-20/+60 deg gun elevation**
- **Powered Optic w/thermal**
- **Laser range finder (LRF)**
- **Fire control w/lead**

7.62mm machine guns firing bullets
.50 cal machine guns firing bullets
25mm machine guns firing grenades
40mm machine guns firing grenades

Ammo count based on 50kg allotment and 3:1 mix

Alternatives / Ammo Types / Loads

Weapon	Anti -Personnel		Anti - Materiel		Total Load
	Round	Count	Round	Count	
M240	M80	1252	M80	418	1670
L94	M80	1252	M80	418	1670
M134*	M80	1252	M80	418	1670
M2HB	M8	297	M8	99	396
XM312	M8	297	M8	99	396
ATK .50	M8	297	M8	99	396
XM307	XM1019	205	XM1049	69	274
XM307FTE	XM1019	205	XM1049	69	274
ATK LW 25	XM1019	205	XM1049	69	274
XM301*	XM1019	205	XM1049	69	274
MK47	PPHE	106	M430	35	141
M129	PPHE	106	M430	35	141

* multi-barrel gatling gun

AMSAA Analysis Approach

PM / Contractor / ARDEC / ALR / ATC/ AMSAA

Anti-personnel Data
- Frag mass/ velocity, penetration equations, etc

ARL / AMSAA

Anti-Materiel Data
- damage state
- cell-by-cell vuln. data
- Pkill / hit

Contractor / ARDEC / AMSAA

Delivery Accuracy Data
Gunner - Aim/wobble, lasing accy and range determination
Weapon – boresight, parallax, launch angle, recoil
Ammunition – Muzzle velocity, drag, spin, fuze timing, disp
Environment – Temp, wind, air den

AMSAA Models

CASRED *- Lethality Effects*
- PK grids, lethal areas

Fbar- Anti-personnel Effects
- Pi, FractCas, Rds/kill etc.

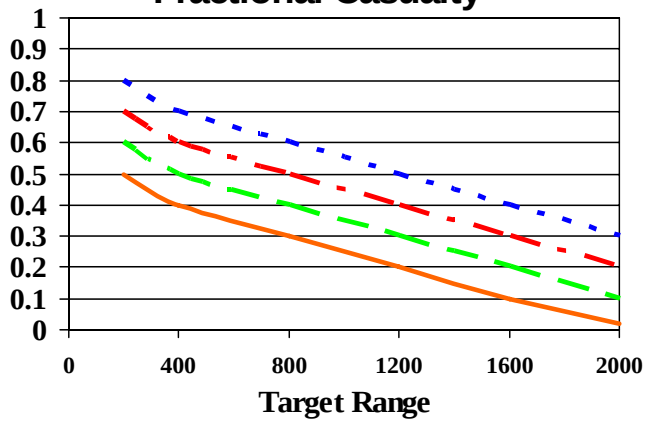
PVTM – Anti-materiel Effects
- Phit, Pkill, Engagement Timeline, Rds/kill etc.

UAMBL / USAIC / AMSAA

Engagement Conditions
- Target set, burst fire meth, tgt exposure, ammo load, etc.

Established ORD Targets

Phit / Pkill / Pincap / Fractional Casualty



Calculate

- ORD Compliance
- Stowed Kills
- Time to Kill

Measures of Effectiveness

ORD Compliance Scoring Methodology

Criteria	Score	
Exceed Objective	10	Score of 6 or greater indicates that ORD KPP is met or exceeded
Midpoint of Objective to Objective	8	
Threshold to midpoint of Objective	6	
2/3rd of Threshold to Threshold	4	Scores under 6 indicates that ORD KPP is not being met
1/3rd-2/3rd of Threshold	2	
0-1/3rd of Threshold	0	

ORD compliance scoring is performed for each performance KPP

STOWED Kills – Rounds "on board" / Number of rounds required to achieve levels of P_k / F_c = X. Normalized to system with most stowed kills, multiplied by 10, and rounded to nearest whole number

Time to Kill - Average Exposure time to kill (achieve P_k / F_c = X) both the Materiel and 8-Man Infantry targets at the Threshold range (time from first round fired to target is dead based on number of bursts needed to kill – incorporates aim/lay time, rate of fire, and 3 sec BDA). Normalized to system with shortest time to kill, multiplied by 10, and rounded to nearest whole number.

Summary Rankings

Alternatives		M240 7.62mm	L94 7.62mm	M134 7.62mm	M2HB .50 cal	XM312 .50 cal	ATK.50 .50 cal	XM307 25mm	XM30FTE 25mm	XM301 25mm	LW25 25mm	MK47 40mm	M129 40mm
Burst Size *		9	9	9	6	6	6	3	3	3	3	3	3
Anti-materiel Scores Averaged Over SS, SM, MS, and MM	ORD Comp. Scores	3.33	3.33	0.50	7.17	7.17	7.17	3.83	3.83	2.50	3.83	2.00	2.00
	Stowed Kills Scores	7.50	7.50	2.55	6.58	6.58	6.58	4.35	4.35	2.87	4.35	1.41	1.41
	Time to Kill Scores	5.67	5.56	2.27	9.92	9.02	8.97	5.03	5.28	4.03	5.03	3.25	3.40
	Weighted Average	4.96	4.93	1.46	7.71	7.49	7.48	4.27	4.32	2.90	4.27	2.16	2.20
Anti-personnel Scores Averaged Over SS, and MS	ORD Comp. Scores	0.67	0.67	0.00	0.67	0.67	0.67	6.00	6.00	5.33	6.00	7.33	7.33
	Stowed Kills Scores	4.57	4.57	1.13	1.63	1.63	1.63	10.00	10.00	8.87	10.00	5.29	5.29
	Time to Kill Scores	3.30	2.91	1.24	2.82	1.90	1.85	7.35	8.90	10.00	4.75	6.90	8.22
	Weighted Average	2.30	2.20	0.59	1.45	1.22	1.20	7.50	7.89	7.39	6.86	6.88	7.21
Combined Weighted Average Score		7.26	7.13	2.05	9.16	8.71	8.68	11.77	12.21	10.36	10.96	9.04	9.41

Weighted Average Score = 0.50*ORD Compliance Score + 0.25* Stowed Kills Score + 0.25 * Time to Kill Score

CCAS Study Summary

- Results
  - .50 cal (bullet) weapons had the highest ORD compliance and weighted average performance scores versus materiel target
  - 25 & 40mm (grenade) weapons with programmable air burst ammunition had by far the highest ORD compliance and weighted average performance scores versus personnel target
  - Averaged over all target scenarios, 25mm (grenade) weapon alternatives had the highest weighted performance score

- Study results presented to Future Combat Systems IPT and PM FCS

Results used in decision for selection of Close Combat Armament System

Brief Description of IWARS

IWARS is:

- Analysis driven
- Entity-based
- Multi-sided simulation
- Focused on individual and small-unit dismounted combatants and their equipment
- Used to assess operational effectiveness across the spectrum of missions, environments and threats



IWARS v1.0 Approved For:

- Soldier Sensor Performance Analyses
- Soldier Small-Arms Lethality Analyses
- Soldier Survivability Analysis
- Limited Situational Awareness / Battle Command Analysis

Army Requires Small Unit Combat Simulation Capabilities to Address Integrated "Soldier-as-a-System" Issues

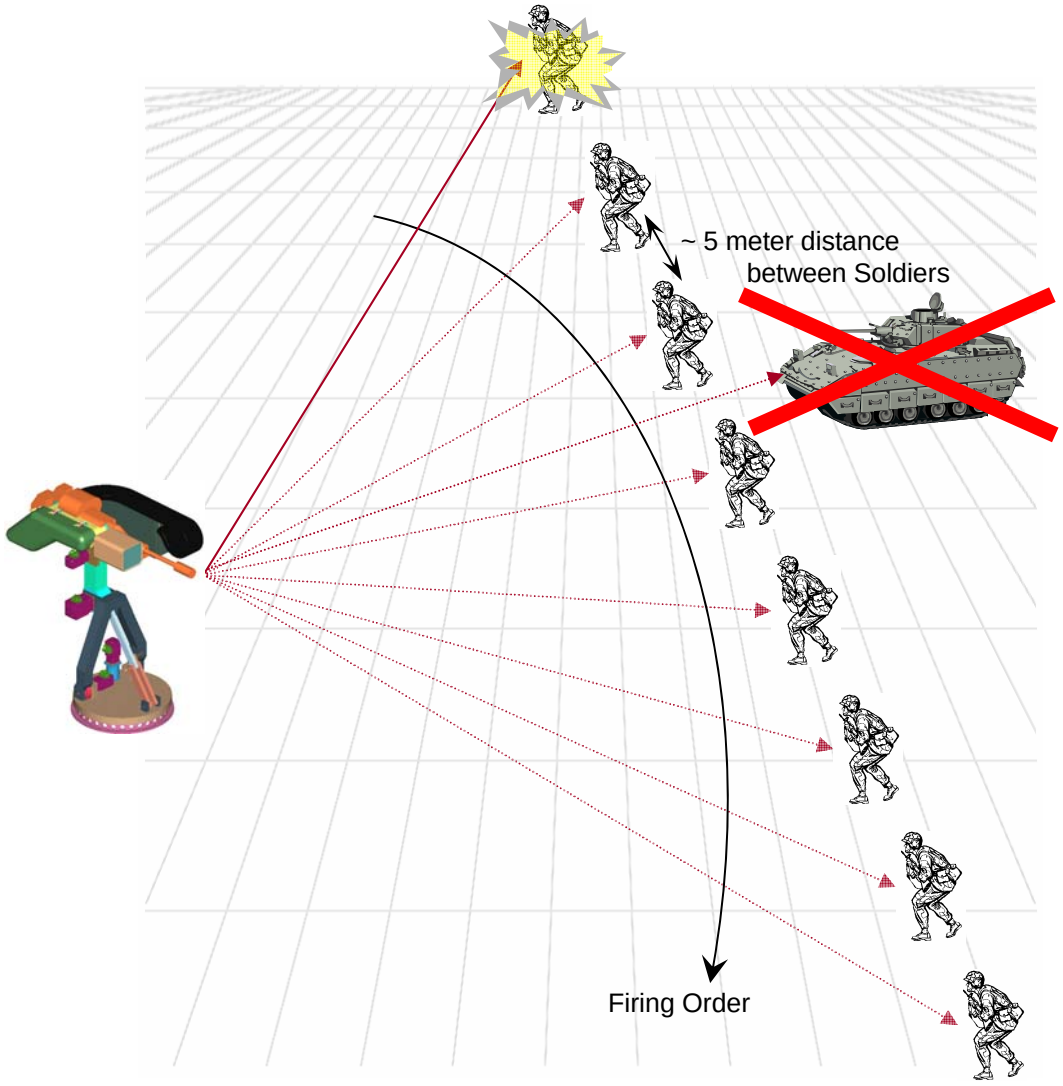
IWARS Scenario

Alternatives / Ammo Types / Loads

Weapon	Anti -Personnel	
	Round	Count
M240	M80	1252
M134*	M80	1252
M2HB	M8	297
XM307	XM1019	205
MK47	PPHE	106

- 7.62mm machine guns firing bullets
- .50 cal machine guns firing bullets
- 25mm machine guns firing grenades
- 40mm machine guns firing grenades

* multi-barrel gatling gun



Anti-personnel Results Rank Order of Effectiveness

Medium Range

Weapon System	FBAR	IWARS
M240	3	3
M134	5	5
M2HB	4	4
XM307	2	2
MK47	1	1

Long Range

Weapon System	FBAR	IWARS
M240	4	3
M134	5	5
M2HB	3	4
XM307	2	2
MK47	1	1

The results for the M240 and M2HB are not statistically different.

IWARS Rankings matched well with FBAR

Summary

- Grenades are most effective
- IWARS consistent with CCAS Study
- Ongoing effort using IWARS to investigate effects on weapons effectiveness due to:
  - Two sided engagement
  - Rate of fire contributions
  - Target acquisition (ACQUIRE methodology) and target prioritization

"What can we do for them today, what can we do for them tomorrow?"

UK MOD Director of Equipment Capability (DEC)



LTC (Ret) Keith Cook MBE MIExpE

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Outline

- Introduction
- FIST Lethality Update
- Discussion of the results
- How we can uplift lethality capability today
- The Future (a personal view!)
- Conclusions

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SDE - Location & Capabilities



- *ISO 9001/2000*
- *List X*

System Approach



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Major Project Support/Partnerships

- FIST – Thales, DCC IPT, Dstl
- NORMANS - FFI
- FDCC Research - QQ
- Type 45 BAE Sys
- CVF – BAE Sys, Thales
- Attack Helicopter - IPT, Westlands, Devonport
- Swedish Squad Support Weapon – FMV, NAMMO, FN, NICO













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The UK Perspective

Today

- Iraq & Afghanistan (**all** our infantry units are deployed on, training for, or returning from operations)
- Still largely equipped to fight a war in central Europe
- Provision of capability through Urgent Operation Requirement (UOR) procurement

Tomorrow

- **?**
- Current SA family due to be replaced 2015-20?
- Changing nature of both research and procurement

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"The difficulty lies not so much in developing new ideas as in escaping from old ones"

"It is better to be roughly right than precisely wrong"

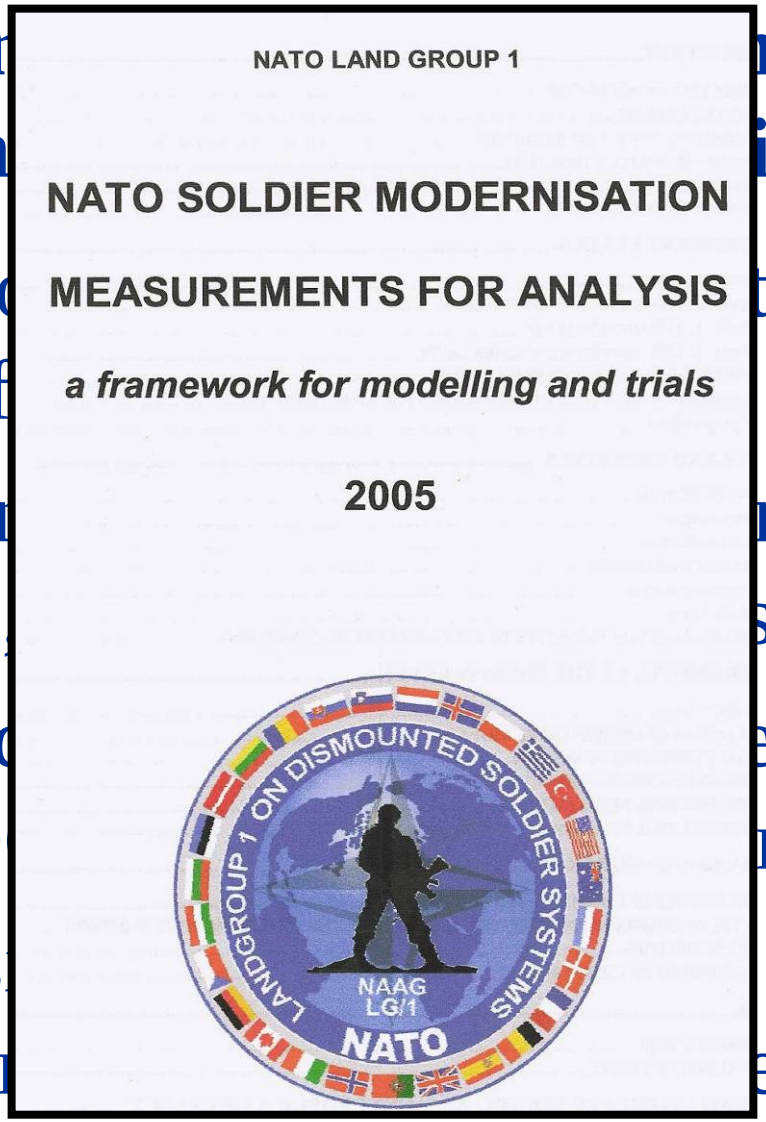
John Maynard Keynes

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Introduction

Any small arr mprovements should be con ing context:

- The sectic the BG context, system of
- Understar nt threats, scenarios, s and target sets.
- A full unc e interaction of NATO D ribute to lethality.
- The trans through performar effect.



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Other factors :

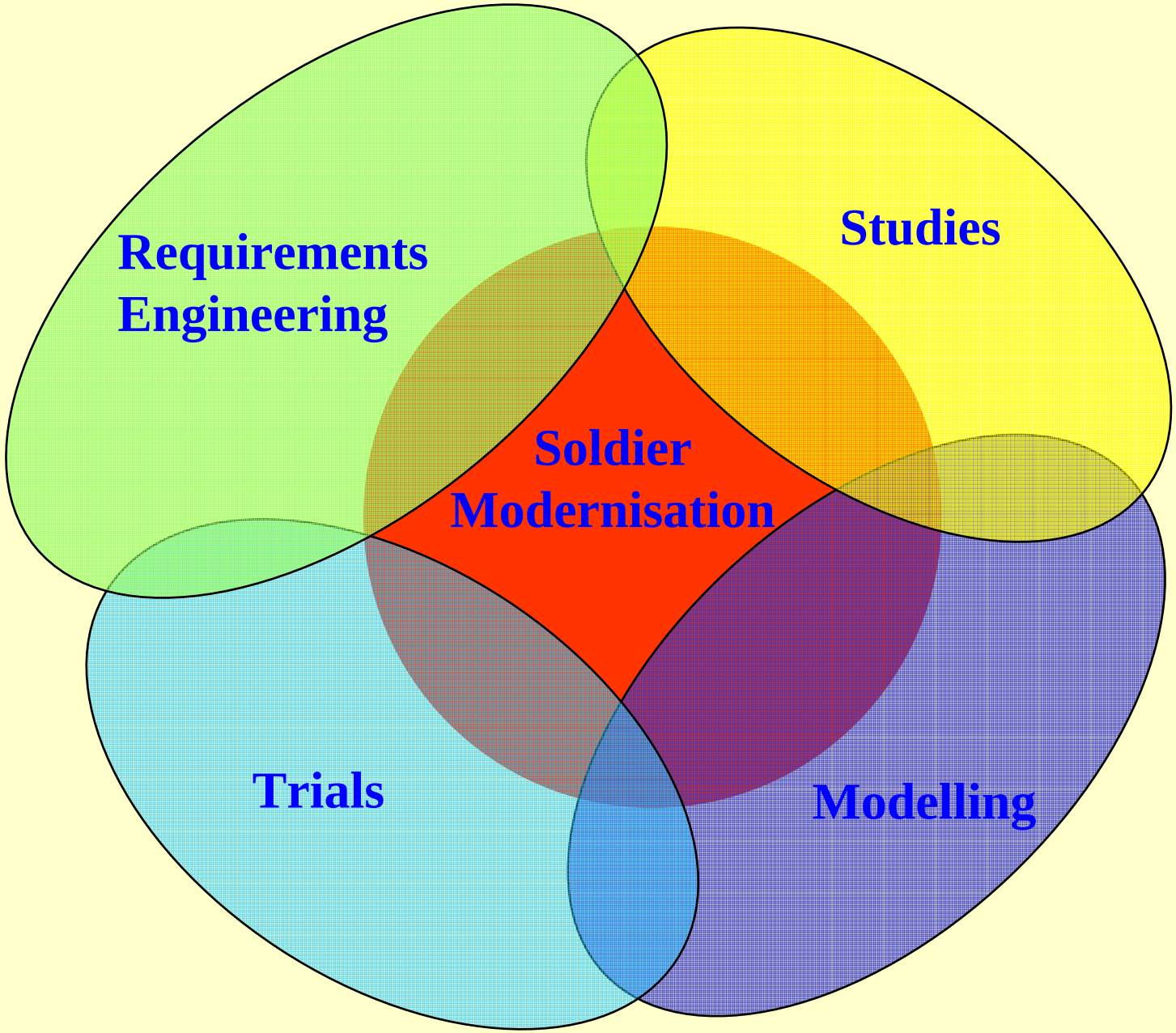
- Interoperability with NATO and other allies.
- The requirements process can be complex due to the interdependencies of NATO DCC Domains.
- And then there is reality:
  - We need it now!
  - No support available!
  - Reversionary mode critical!

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Soldier Modernisation

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Training
Logistics
Equipment
Lethality
Mobility
C4I
Infrastructure
Personnel
Sustain
Survive
Organisation
Information
Doctrine


Requirements Engineering
Studies
Soldier Modernisation
Trials
Modelling

Trials

- System Effectiveness C4I
- System Effectiveness Lethality
- Baseline Lethality
- Judging Distance
- LRF
- FCS
- MGL
- Suppressors
- 40 mm First Round Accuracy and Engagement effectiveness
- STA (laser aimer, red dot, HUD, optics, II, TI, DWS etc)

Etc,Etc

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Error Budgets, Effectiveness Modelling (ASPECT™) and Studies

- 5.56 mm (IW, LSW, LMG)
- 40 x 46 mm Low Velocity
- 40 x 46 mm Medium Velocity
- PDW
- Round Firing Sensors
- Lethality Operational Effectiveness
- Lethality Survivability
- Lethality Tempo
- C4I Trial Planning

Etc, Etc, Etc

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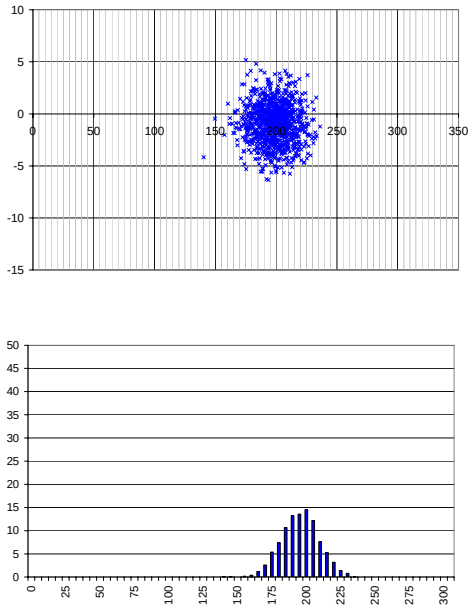
Modelling

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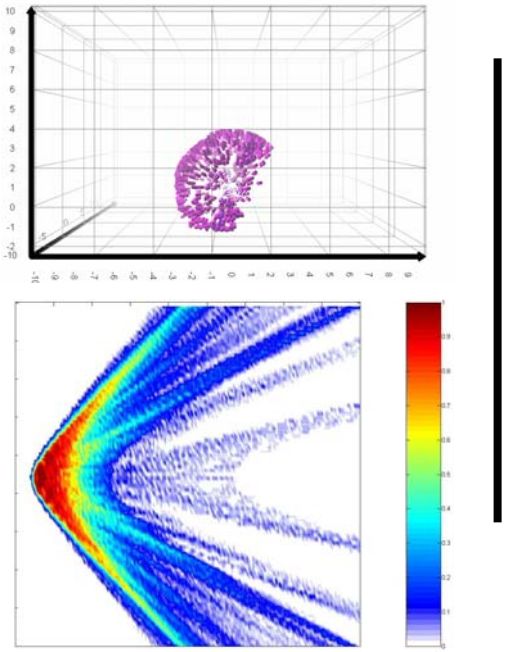
Analysis of System Performance and EffeCtiveness Tool (ASPECT™)

- Analysis Capabilities of SDE's *ASPECT™* Software Suite

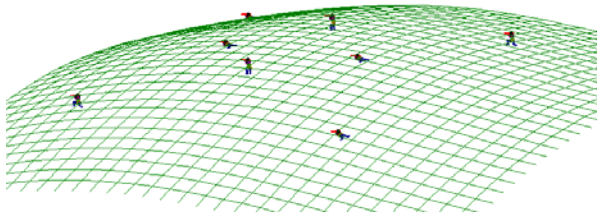
System Error Budgets



Terminal Effects



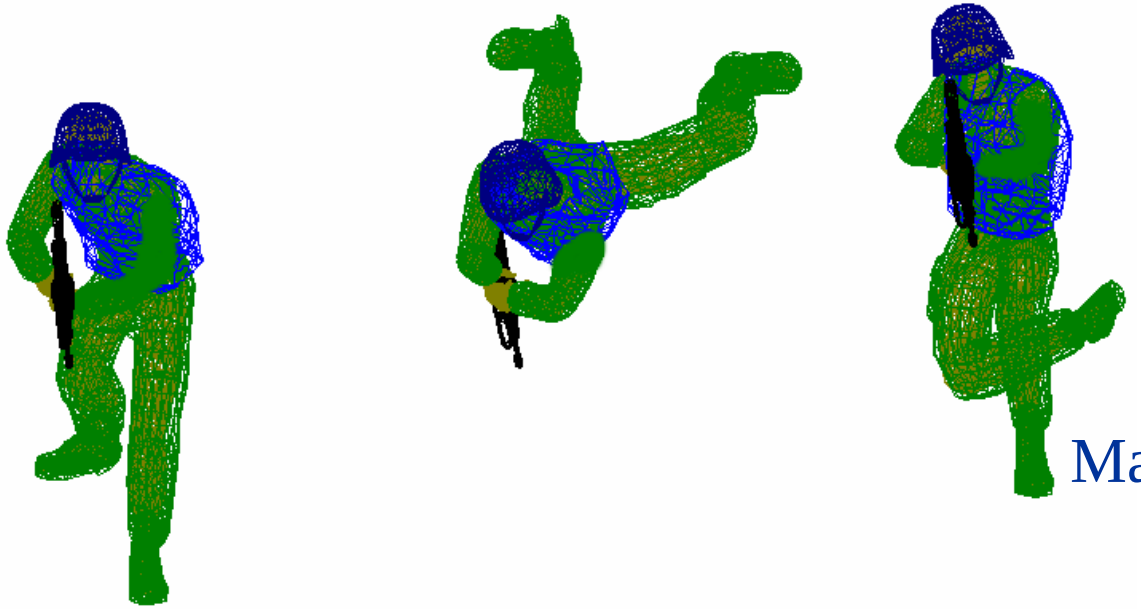
System Effectiveness



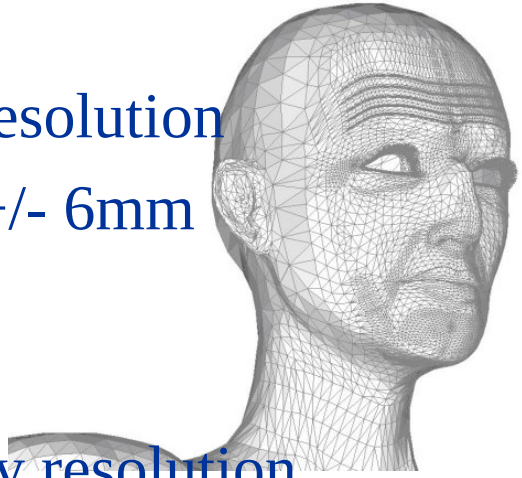
Against static or moving target / target array

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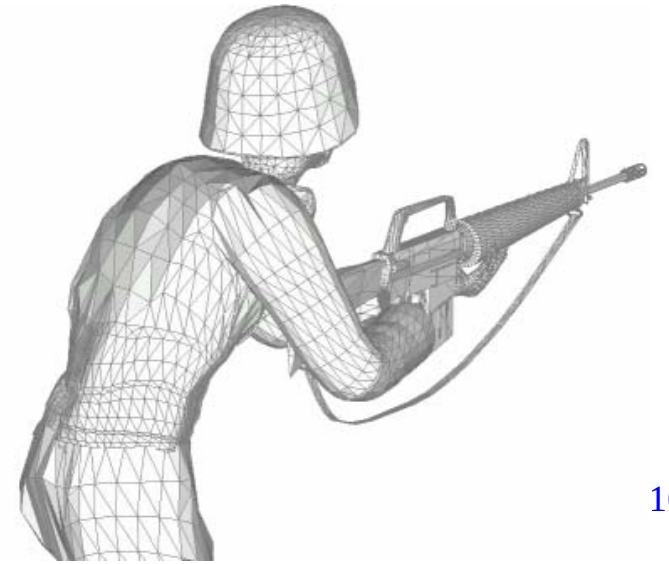
Weapon Effectiveness
Target Arrays - Personnel



Head resolution
= +/- 6mm



Main body resolution
= +/- 10mm



Benefits of high resolution models

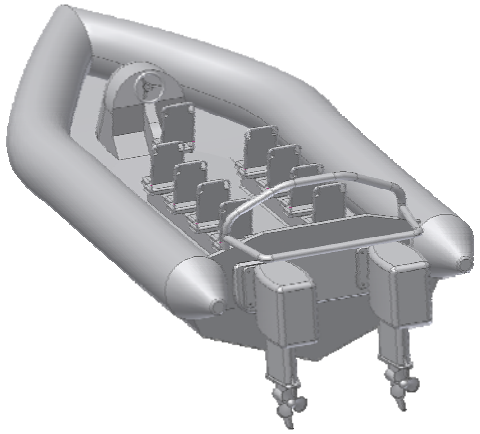
- High degree of accuracy

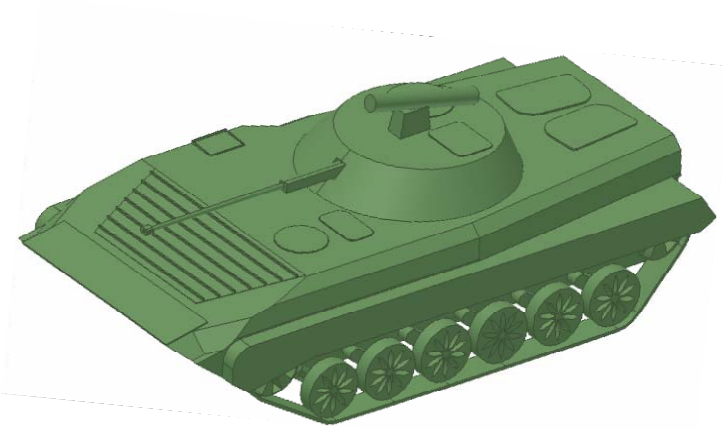
- Detailed point of hit data

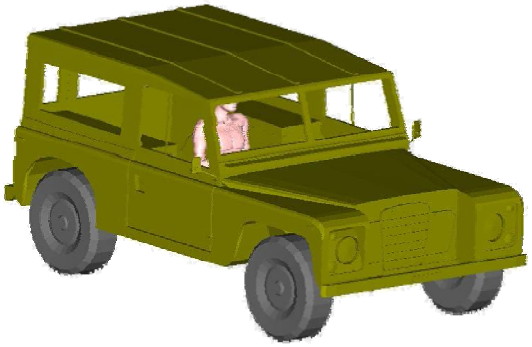
- 3D models allow fully customisable postures and equipment load

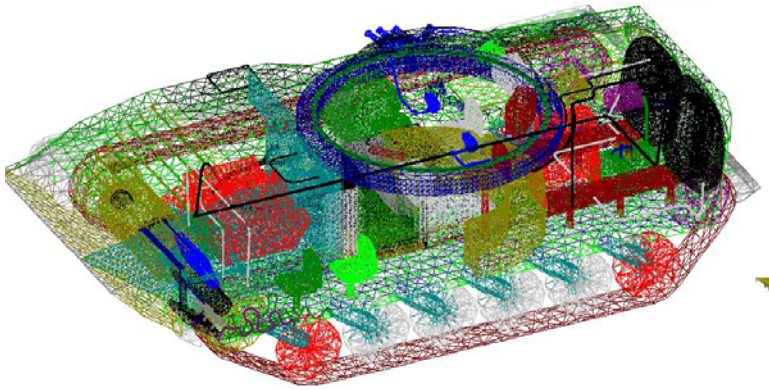
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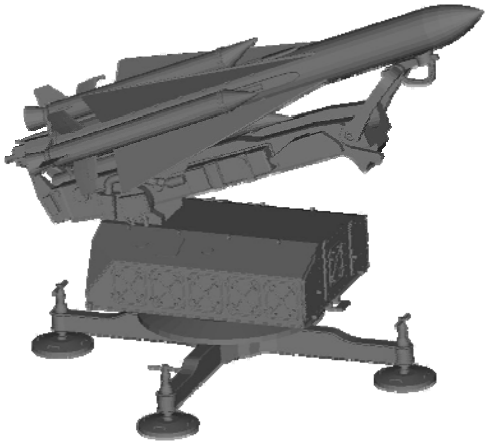
Weapon Effectiveness
Target Arrays - Vehicles

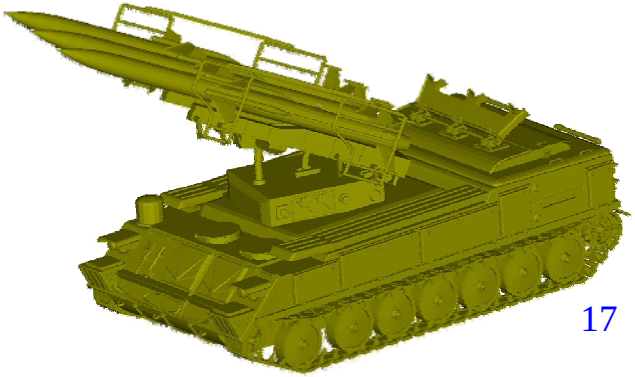












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Dual Purpose Model

Lethality

Probability of Initial Suppression:
- Rounds Required
- Time Required

Probability of the Maintenance of Suppression:
- % of time suppressed
- Average Rounds Suppressing
- Average Rounds Incapacitating

'Cost' of Suppression:
- % Ammo wastage
- Suppression time per Kg of ammunition

Protection

Probability of Incapacitation

Trade Off Metrics
- Probability of fragments/projectiles hitting specific areas of the body
- Residual energy of the fragments/projectiles

Design Assessments

- Multi dimensional analysis of protection system performance including area coverage and protection level (e.g Helmet shape, Plate size)

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Soldier/Weapon System Assessment Range

© System Design Evaluation 2007

Weapon/Soldier System Assessment Range









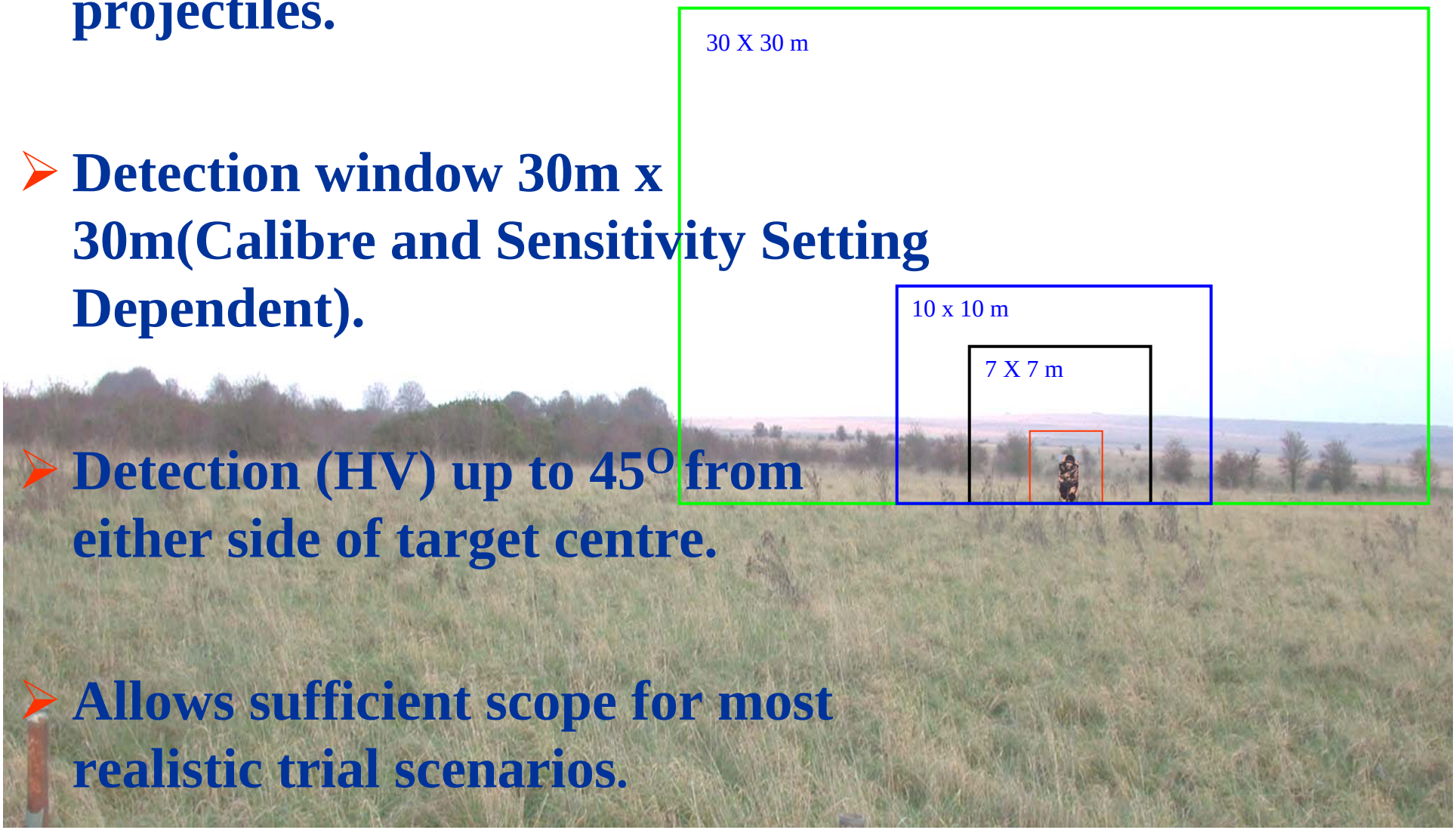




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Characteristics - Shot Detection

- **Accurate detection of high velocity projectiles.**
- **Detection window 30m x 30m(Calibre and Sensitivity Setting Dependent).**
- **Detection (HV) up to 45^{O} from either side of target centre.**
- **Allows sufficient scope for most realistic trial scenarios.**



Live Fire Intelligent Target (LFIT) System



Live Fire Intelligent Target (LFIT)

The 'intelligent' targets capture the time and position (in 3D-space) of all shots that pass within close proximity to the target. The software processes this information to determine whether that specific shot would have resulted in a **miss**, a **hit** or a **suppressive effect** upon the target.

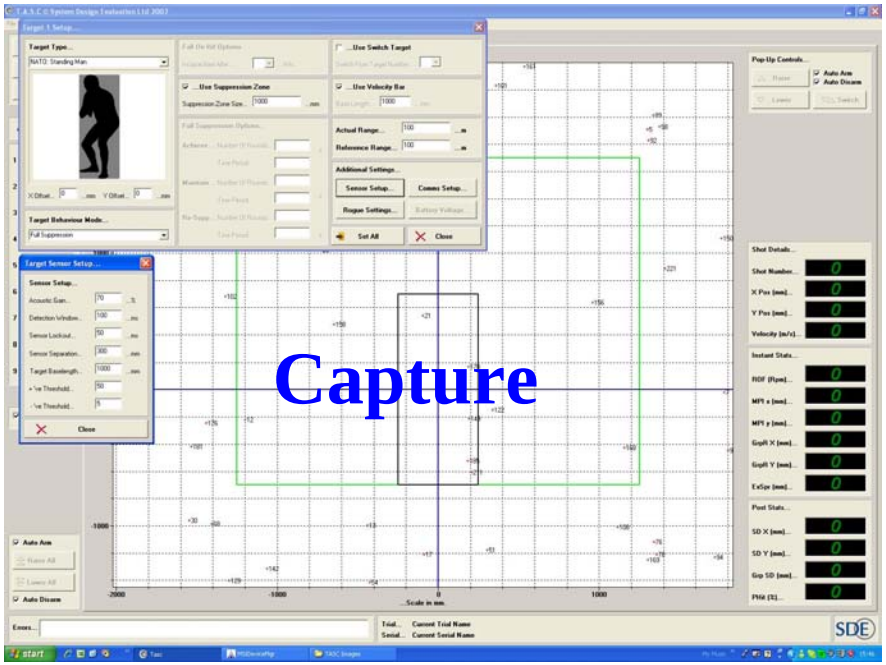
The LFIT simulate the response of a potential enemy to the effectiveness of the incom[illegible]om the exercising troops and the targets re[illegible] **'intelligently'** to the incoming fire, in **autonomous** manner

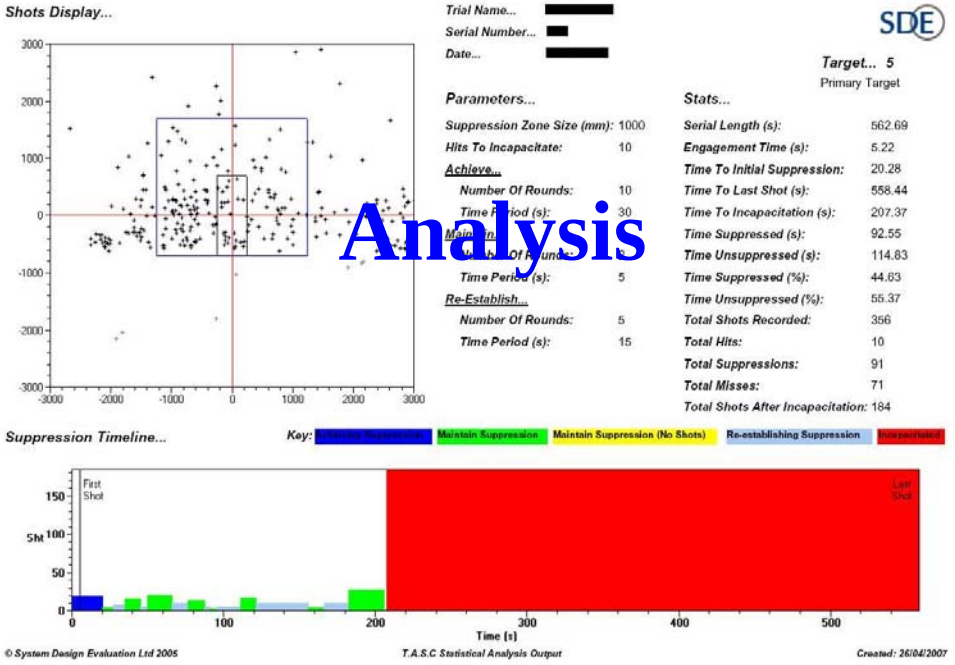


Suppression can be measured!

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Software





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Measures Of Effectiveness (MOE)

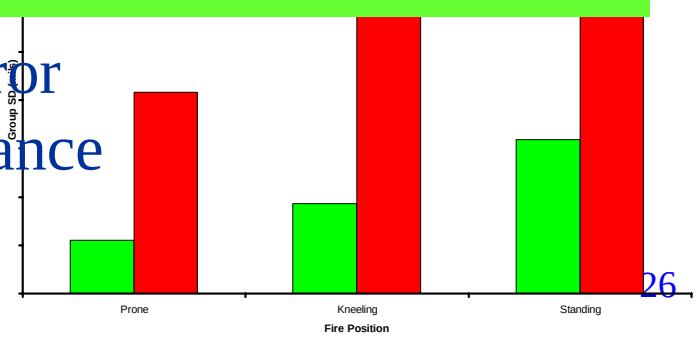
- Time to engage target;
- Ti
- D
  ar
- Pr
  effect upon the target;
- Proportion of serial duration for which the target was suppressed;
- Time to kill the target

Output feeds directly into SDE's ***ASPECT***™ And the UK MOD Defence Science and & Technical Laboratory's (Dstl) Close Action ENvironment (CAEn) OA model

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Baseline Trial - MOPs

- Comprehensive set of performance data for all in service SA weapons & sights covering: day, night, NBC IPE, all combat fire positions, modes of fire
- **"*Overall shooting standards may not be as high as commonly believed*"**
- Infantry Trials Development Unit (ITDU) Baseline Trial Report
- The man is the greatest contributor to the error budget and there is a wide range of performance within the section



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Recent Lethality Enhancements
STA



HUD



Optic + Red Dot



Red Dot



Optic





NO DRI
Day Only





TI

Night











LLM

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STA Trials



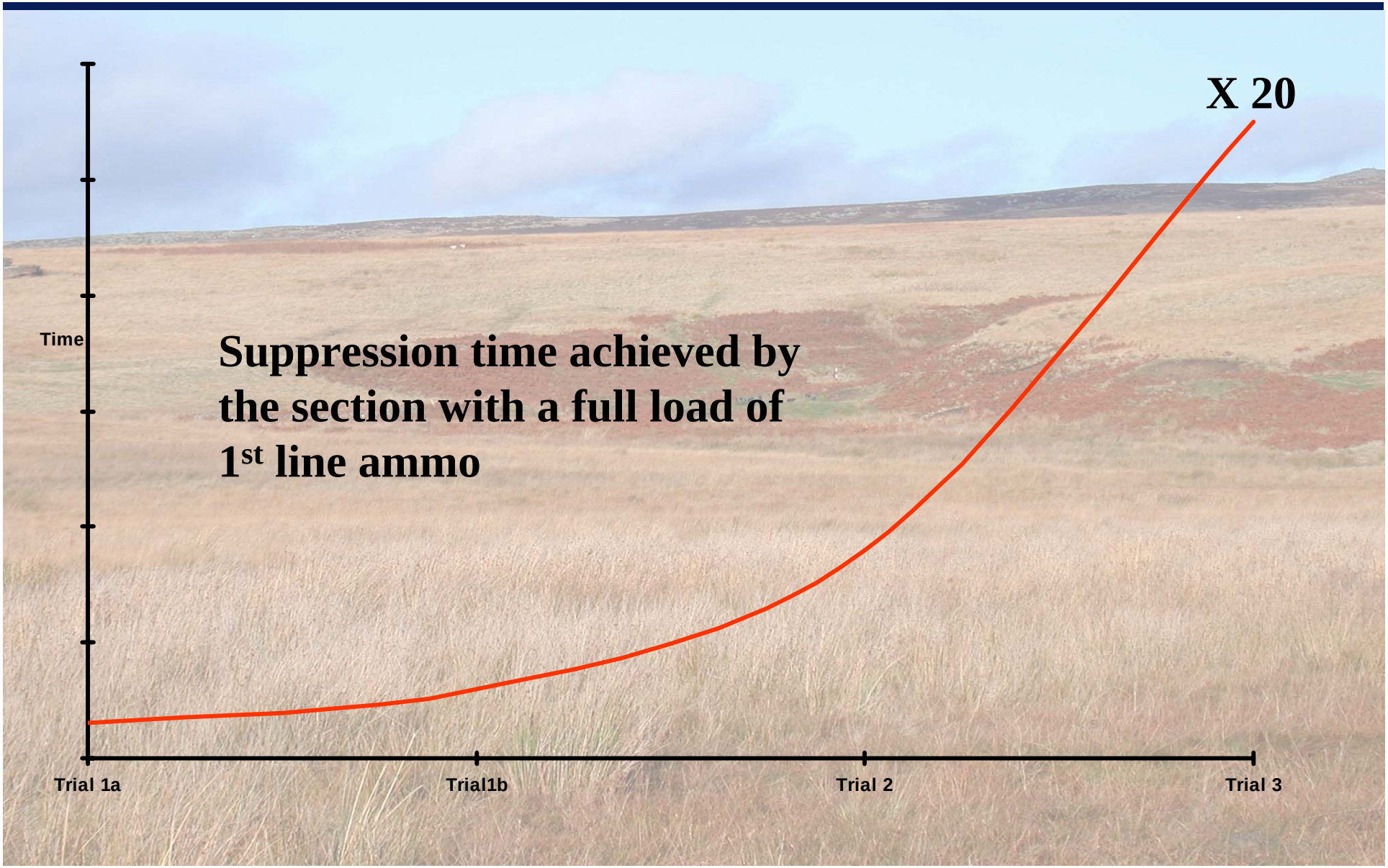
Are we tweaking?

&

Does it improve performance?

Laser
Red Dot
Optic
TI
HUD

System Weapon Effectiveness Trials
Suppression Time



Dstl Comment on LFIT

"An evolutionary step has been taken in the design, development and implementation of a measurement strategy, with supporting instrumentation, to help evaluate the effectiveness of small arms fire on the battlefield."

[dstl]

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The Holistic View

Training

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Dstl Key Recommendation

The SSAR instrumentation be used to enhance training and in particular train fire team commanders in developing the key skills of control and co-ordination of fire.

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Infantry (Individual)

The Infantry soldier must be able to react quickly and to fire accurately to kill or suppress an enemy to the limits of the battle range of his personal weapon, or at close quarters, from different static positions, on the move and from cover.



Reference: UK AOSP Chapter 1

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Infantry (Fire Team)

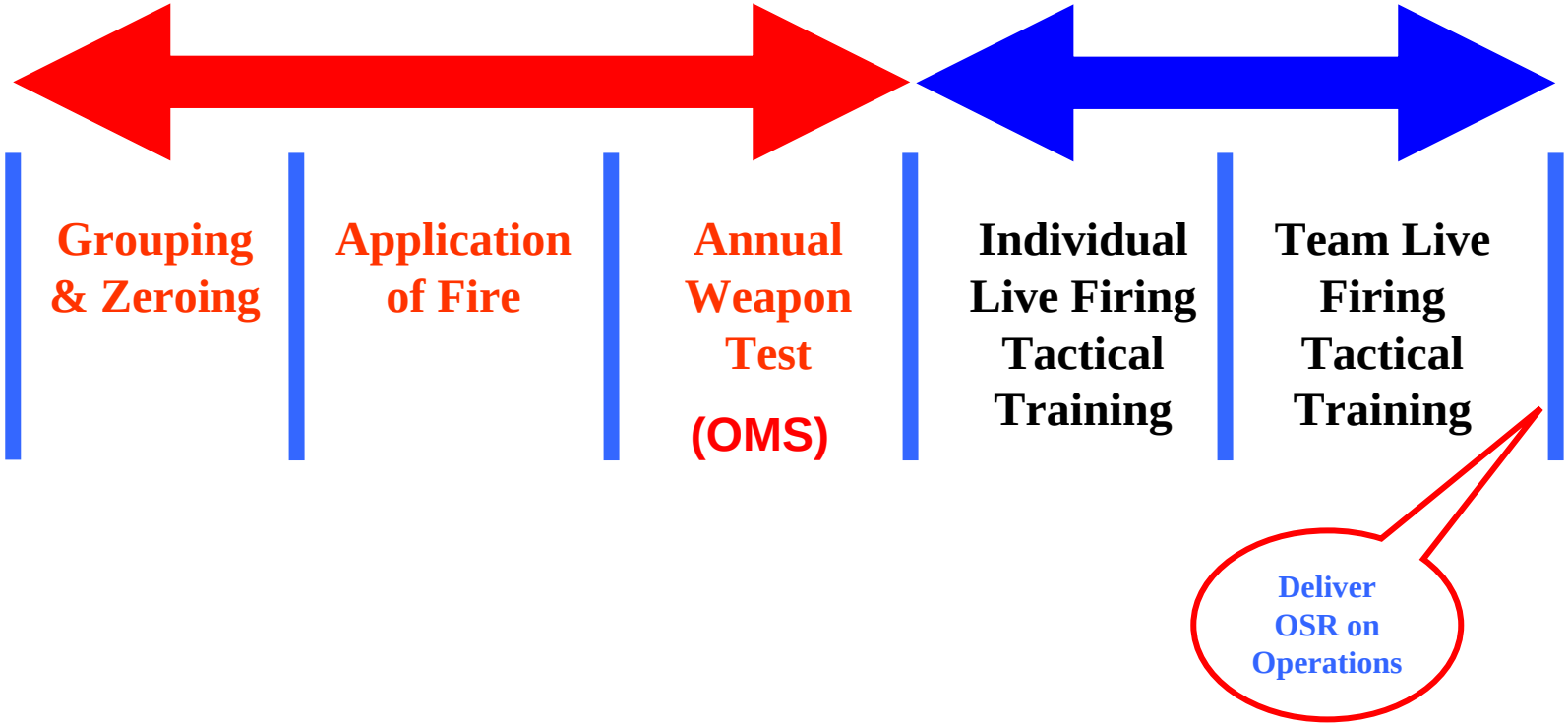
Four-man teams must be able to kill or suppress an enemy in defence and in offensive operations at battle ranges to X metres.



Reference: UK AOSP Chapter 1

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Current Process



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Measure Of Performance (MOP)

- The Operational Marksmanship Standards (OMS) are Measures Of Performance.

- The Measured Performance is “achieve “X” % hits at “Y” range on “Z” target”.

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Current Process

Grouping & Zeroing

Application of Fire

Annual Weapon Test

OMS=MOP

Individual Live Firing Tactical Training

Team Live Firing Tactical Training

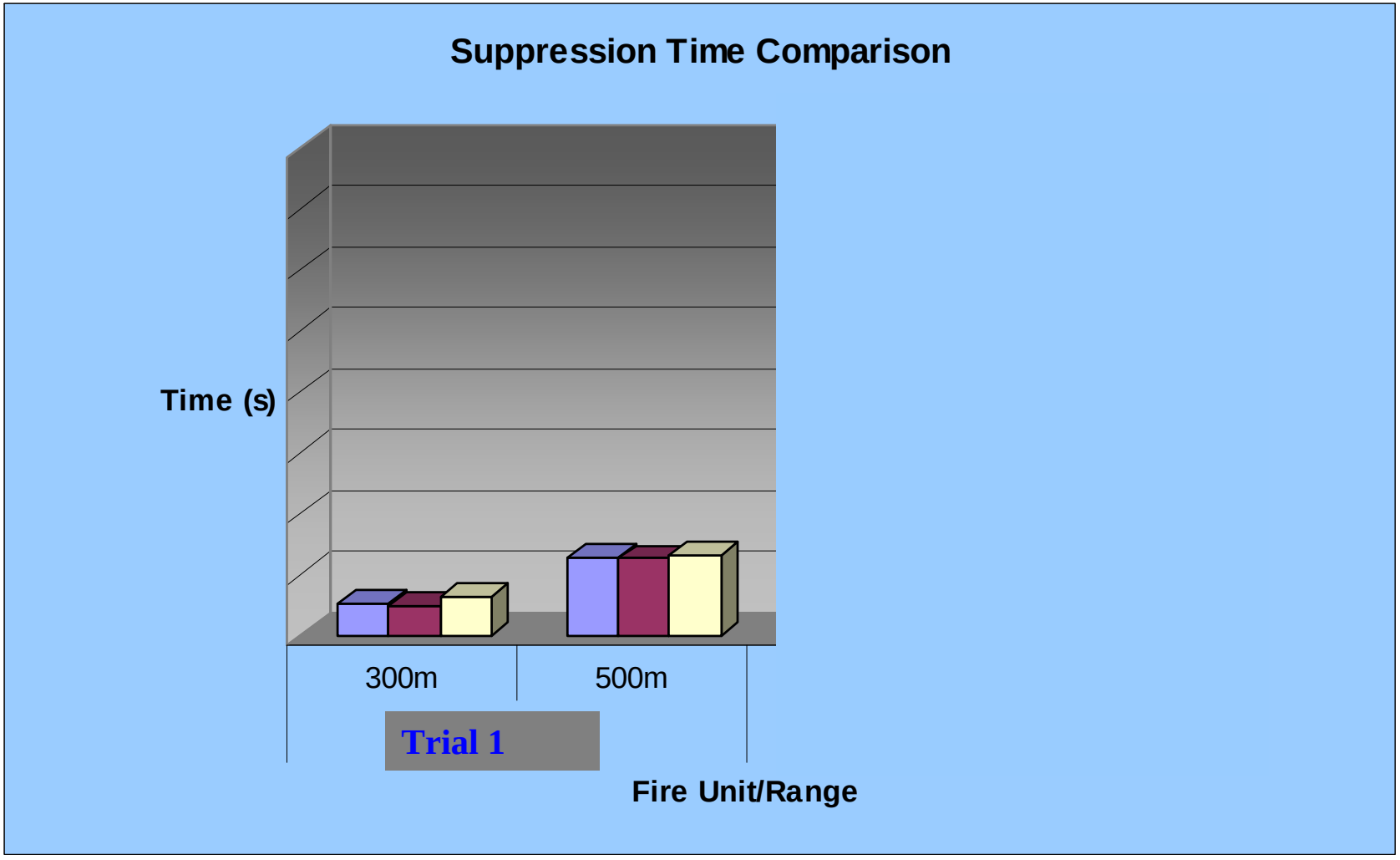


Delivery of Effect

Robust Link?

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A Different Approach

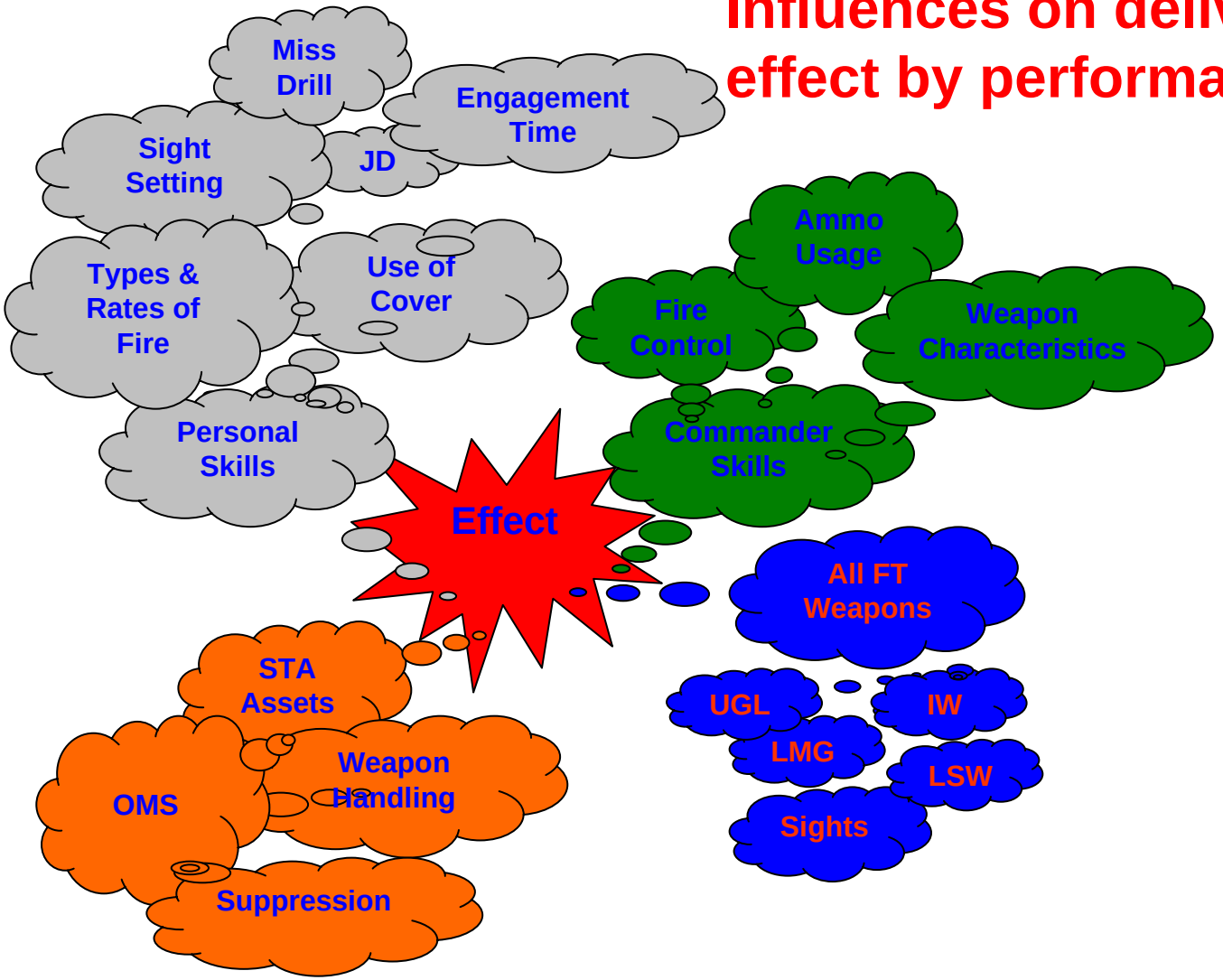


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System Weapon Effectiveness Trials
Suppression Time

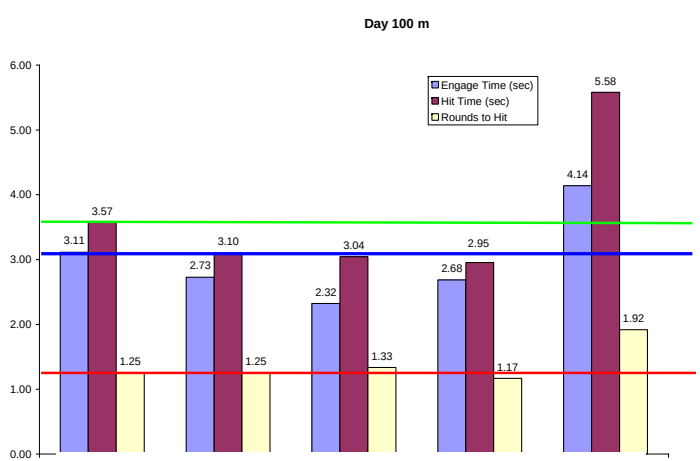


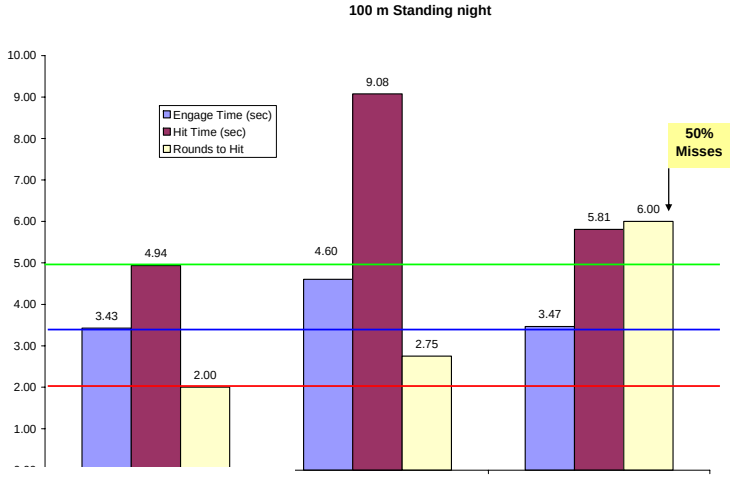
Influences on delivery of effect by performance



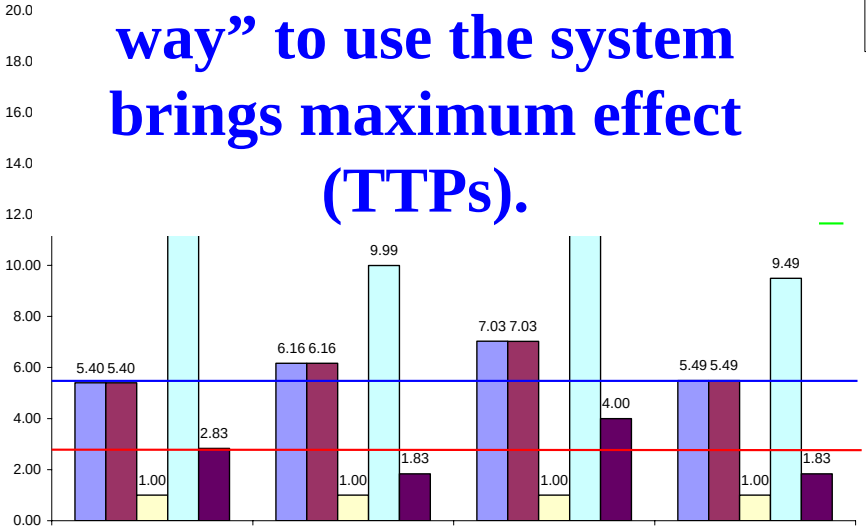
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What About Effect?





Determining the "best way" to use the system brings maximum effect (TTPs).



Tomorrow

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Achieving dominance by maximising firepower at the applicable level





Questions

So once the infantry have identified and fixed the enemy how do we achieve dominance by maximising firepower at the applicable level?

What are the technologies and developments that need to occur for the enemy to be defeated?

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Some Factors

- Asymmetric Threat
- Current Operational Environment will shape our ideas and structures
- Casualties will be less tolerable
- Precision
- Coalition Environment. Commonality of:
  - Protocols
  - TTPs
  - Natures
- Capability lift by the delivery of the right effect at the right time (C4I)

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Calibre
(Optimise or/is it Compromise?)







PH – PIH - PI







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Modularity





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HMG



Mortars



Snipers



IFV



Organic DCC Crew Served Weapons

MMG



A/TK



AGL



LSpV



Conclusions

- Technology developments will continue to enhance performance (Caseless (reduce weight), shooter sensor link etc).
- Technology is not the holy grail for shoulder controlled weapons in DCC.
- Significant advances in “individual fires at section level” will only be realised by a holistic approach including:
  - Interaction with other NATO DCC domains.
  - Evolving TTPs.
- The user must become change agents.

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Conclusions (continued)

- **Today** Other than improving sights and STA the most significant uplift in capability could be achieved by changing the way we train our fire team Comds and individual soldiers. **"Train to make the best use of what we already have!"**
- **Tomorrow** the most significant uplift in capability is likely to achieved by changes to TTPs that advances in technology will offer and harnessing the lethality offered by both organic and non organic support weapon systems through C4I. **"Doing better things not doing things better!"**
- Quick Wins are rightly important.
- In DCC robust reversionary modes are vital

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Questions?







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Joint Service Small Arms Synchronization Team (JSSAST) Update

for

Joint Services Small Systems Section Annual Symposium, Exhibition and Firing Demonstration

8 May 2007

Presented By

COL Scott Crizer
JSSAST Chairman

JSSAST Update

Agenda

- JSSAST Mission
- JSSAST Membership
- Overarching Themes and Status
- What's Next?

Members

Joint Service Small Arms Program Office (JSSAP)

- **Who**
  - ➔ **Joint Service Office Located Within the Army Armaments Research Development and Engineering Center**
- **Mission**
  - ➔ **Establish Joint Requirements**
  - ➔ **Evolve Technology for New Soldier Weapon Systems**
  - ➔ **Manage and Execute the Technology Base**
- **Funding**
  - ➔ **Annual Funding to Increase to $17M+ by FY13**
  - ➔ **Congress has historically added a few $M annually**
  - ➔ **Funding will now support: One Major Effort**
    - **Lightweight Small Arms Technologies**
    - **2 New Thrusts Beginning in FY08**

Charter Updated and Approved by ASA (ALT) Hon Claude Bolton 31 Aug 04

Members

Joint Service Small Arms Synchronization Team (JSSAST)

Meets Semiannually

Chairman

COL Scott Crizer (Commander, ASIC)

Principals:

Army:	COL Robert Radcliffe (USAIC)
Marines:	LtCol Tracy Tafolla (HQ MCSC)
Air Force:	Col C. Beck (HQ AFSFC)
Navy:	CAPT R. Ruehlin (HQ NAVSEA)
Coast Guard:	CDR Jim Olive (HQ USCG)
SOCOM:	COL K. Noonan (HQ SOCOM)

Associates:

Army PMSW:	COL C. Lipsit (PM Soldier Weapons)
JNLWD:	Mr. K. Swenson (JNLWD)

JSSAST

Chairman's Overarching Themes

- Better Synchronization of Service Small Arms Activities
- Greater Awareness of JSSAP's Work
- More Funding for Small Arms Science and Technology

Better Synchronization



JSSAMP Approved 7 Feb 07

Awareness Campaign Status

Completed

- CG Fort Benning and Commandant Army Infantry Center
- HQ USAF Director of Security Forces
- USMC Director of Infantry Weapon Systems
- HQDA G-8 Director of Joint & Futures
- HQ SOCOM Deputy Commander and G-8
- HQ NAVSEASYSCOM SES

Planned

- Director of Capabilities Development TRADOC HQ – May 07
- CG Marine Corps Systems Command – Jun 07

Expanded JSSAP Tech Thrusts

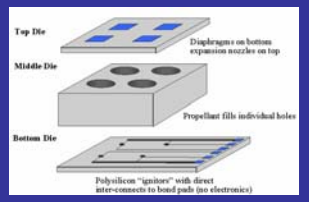








Advanced Fire Control Technology





Advanced Lethal Armament Technology

Resulting from $17M Increase over the POM

JSSAST Update

What's Next?

- HQ Endorsements of JSSAMP
- Complete Operational Awareness Campaign
- Execute Newly Developed Technology Thrusts

NAVSEA
WARFARE CENTERS
CRANE

U.S. Special Operations Command
SOPMOD

NSWC Crane

"Harnessing the Power of Technology for the Warfighter"

Weapon Shot Counter (WSC)

8 May 2007

Presented by Mr. Jason Davis,
USSOCOM Weapon Shot Counter
Project Manager



NAVSEA WARFARE CENTERS CRANE

U.S. Special Operations Command SOPMOD

NDIA NATIONAL DEFENSE INDUSTRIAL ASSOCIATION
STRENGTH THROUGH INDUSTRY & TECHNOLOGY

Presented to NDIA Small Arms Symposium

Distribution Statement A - Approved for public release; distribution unlimited.

Shot Counter Agenda

- **Mission and Goals**
- **Basics of WSC Technology**
- **Software Development**
- **Acquisition Strategy**
- **Future of WSC Technology**
- **Questions or Comments**

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Mission Statement



SOPMOD PMO, NSWC Crane, will develop and acquire a Shot Counter for small arms. The Shot Counter will provide count, cadence of fire, weapon serial number, and other data necessary to develop an automated maintenance program for small arms. The maintenance program will predict barrel, bolt, and parts failures for timely replacement. The Shot Counter will first be compatible with the M4A1 Carbine using existing munitions. It will include a Data Collection Device and software compatible with common desktop and laptop computers. It will be reliable and durable in Special Operations Forces environments. It will be upgradeable to other small arms and calibers.

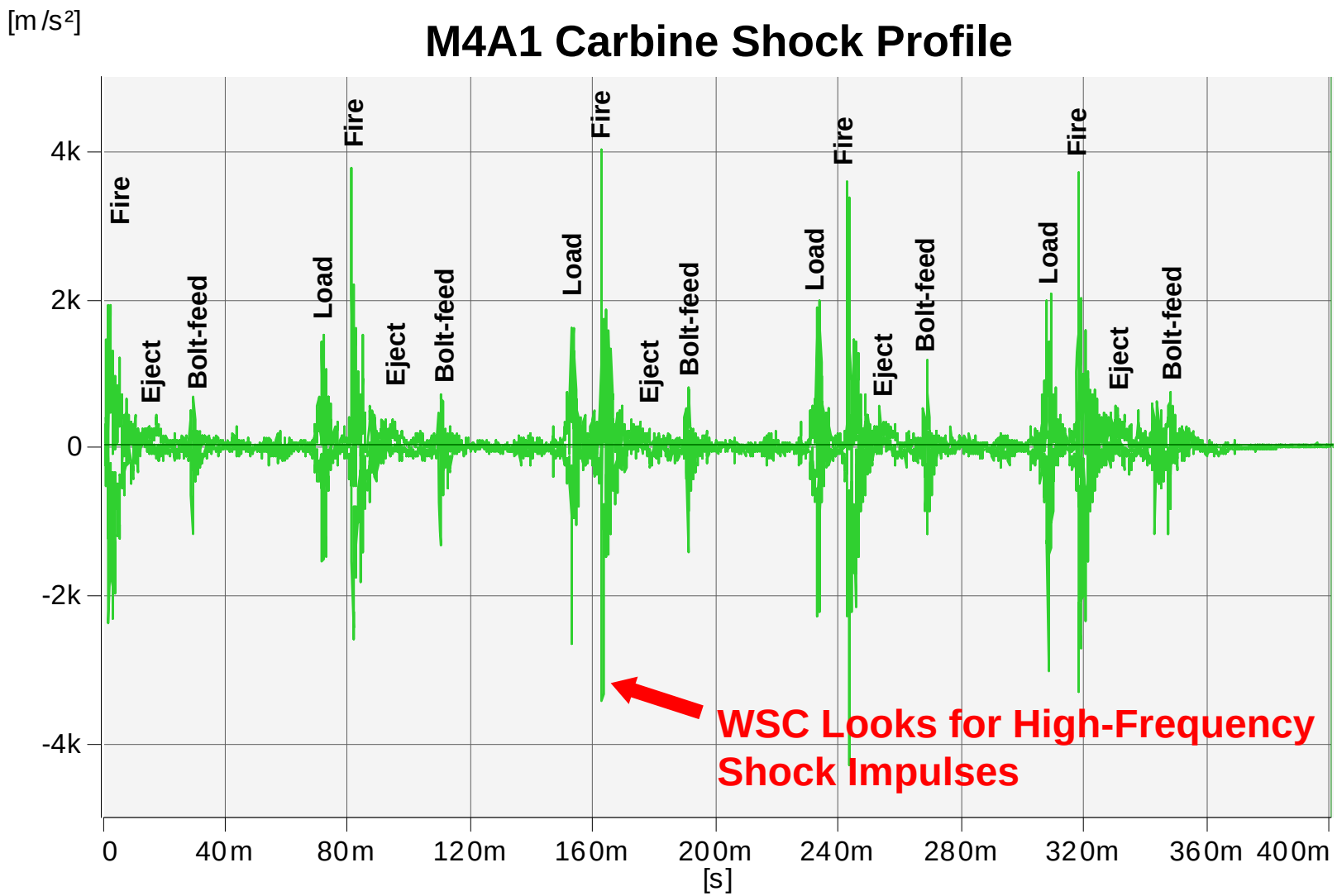
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Weapon Shot Counter Benefits

- **Primary Benefits**
  - **Prevent Failures Before They Occur, Reducing Injuries and Saving Lives**
  - **Reduce Unnecessary Maintenance Costs**
- **Secondary Benefits**
  - **Possible Insight into Ancillary Equipment Failure**
  - **Additional Means of Comparing Vendor Parts**
  - **Compare Failure Occurrences Between Different Types of Weapons**

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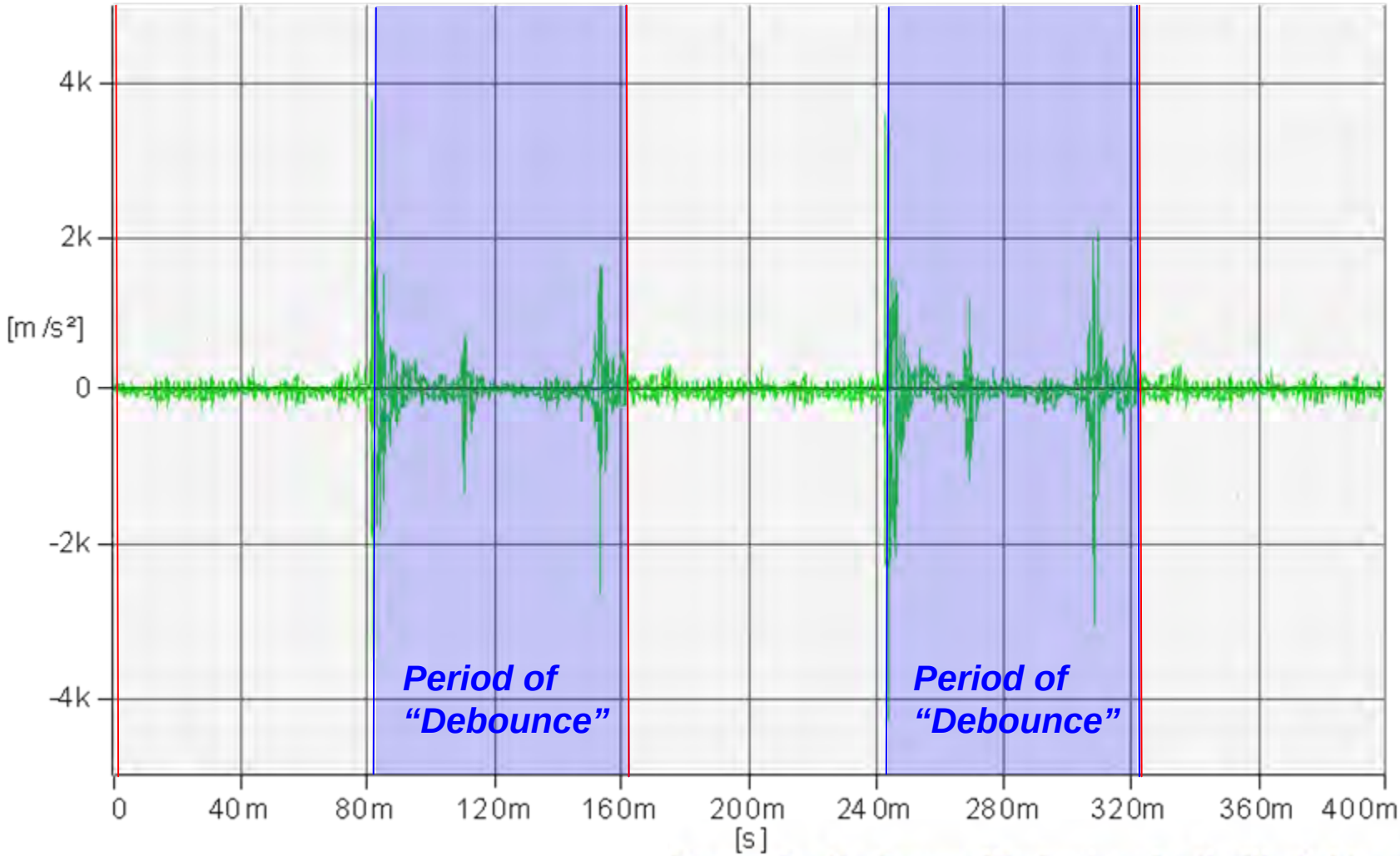
How WSC Technology Works



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How WSC Technology Works

2



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WSC Current Events



- **Accu-Counter Technologies (Erlanger, KY) Selected for M4A1 Carbine WSC**

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SOPMOD/Armorer Designed

- **Integrates Part Failure Data Directly with Round Count. Software Suggests Required Maintenance.**
- **Automatically Records Results of Scan in a Maintenance Log.**
- **Maintenance Log Will Permit Armorers to Record Part Replacement and Reason for Replacement.**
- **Software Will Provide Armorer with Overall *Health* of Weapons.**
- **Easily Expandable for Inclusion of Other Weapons, Other WSC Vendors, Better Statistics on Round Count / Part Failure Correlation, and Additional Data Supplied by Future WSCs (such as Barrel Temp). Entirely Government Controlled.**
- **Software Will Allow Armorer to Age Weapon Parts if Necessary.**

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Software Development

Overall Weapon Health



▲	No attention needed
■	Action may be required
◀	Maintenance suggested

Weapon S/N	Barrel	Bolt	Gas Rings	Hammer Spring	Extractor Assy	Ejector Assy	Overall Weapon Health
W345703	▲	■	◀	▲	■	■	87%
W345011	▲	▲	■	▲	▲	▲	90%
W345703	▲	▲	◀	◀	▲	◀	64%
W350824	■	▲	▲	▲	■	▲	83%
W345911	▲	▲	■	▲	◀	▲	72%
W350824	◀	▲	▲	▲	■	■	10%
W350833	▲	▲	■	▲	▲	▲	90%

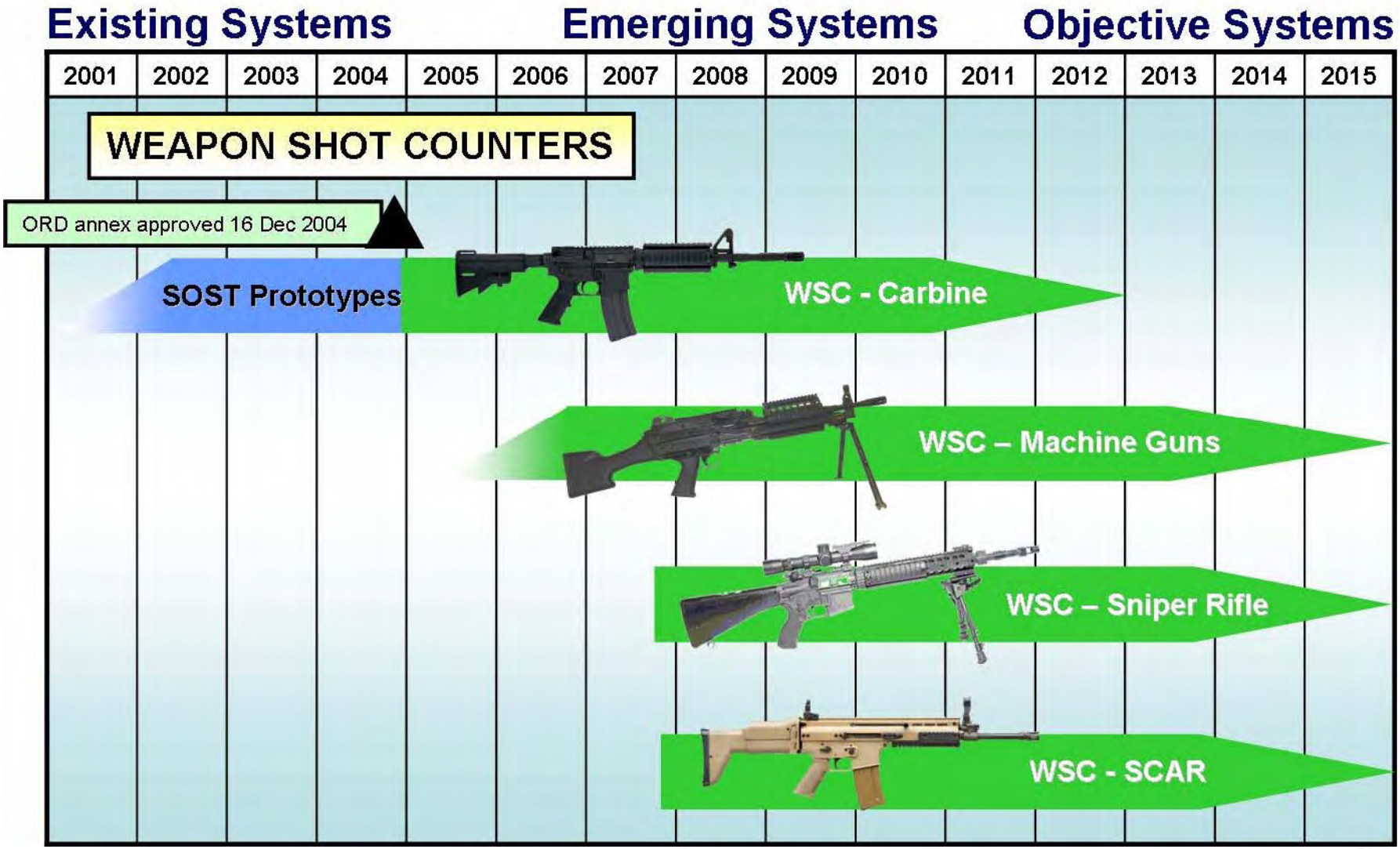
SCAN WEAPON PRINT EXPORT

Distribution Statement A - Approved for public release; distribution unlimited.

Acquisition Strategy

Distribution Statement A - Approved for public release; distribution unlimited.

Acquisition Top Map



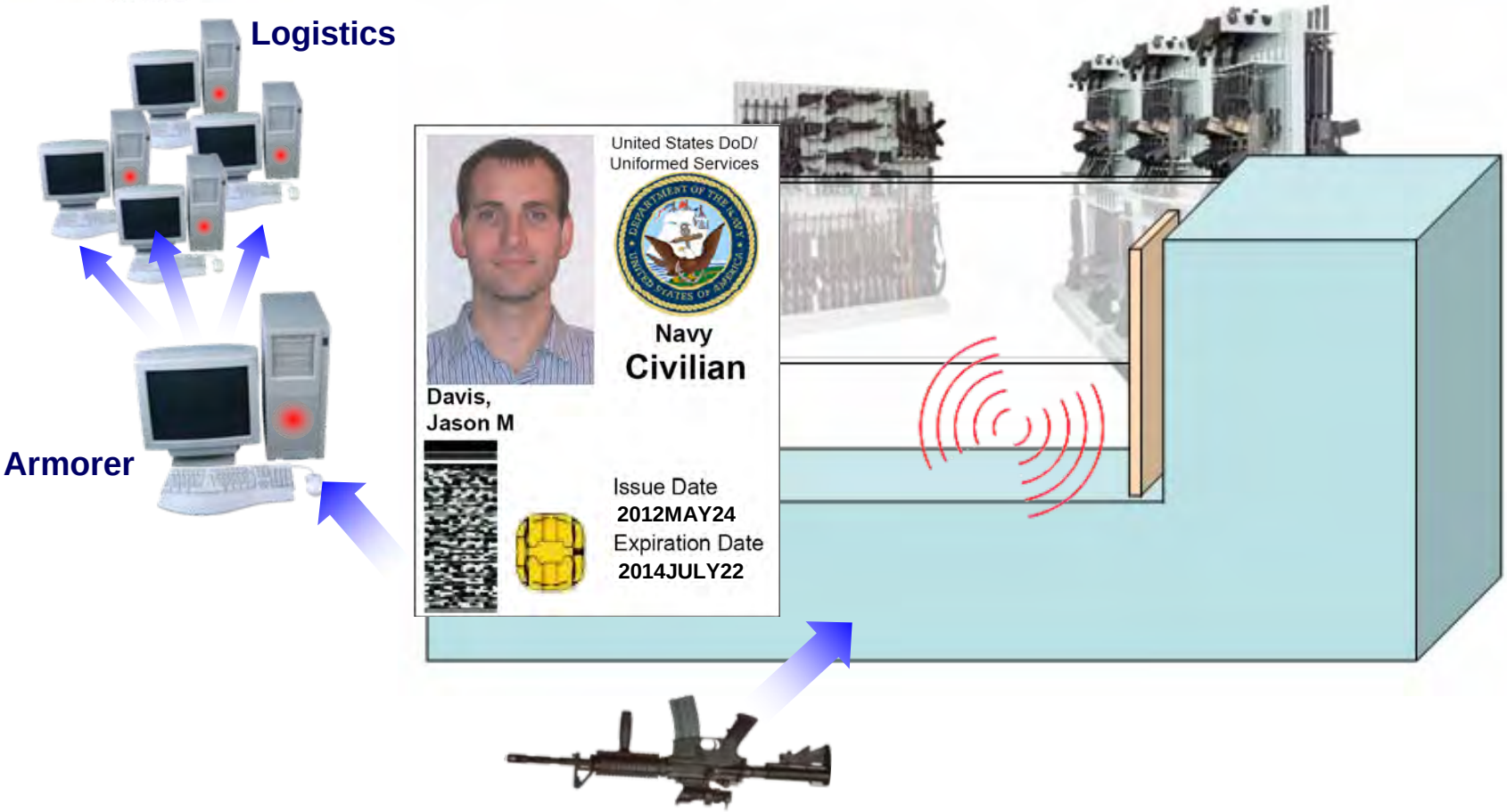
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Future of WSC Technology

- **WSC Integral to Weapon, Not an Accessory**
- **Use of RFID Wireless Inventory Management**
- **WSC Stores Entire Maintenance History**
- **More Sophisticated Sensors: Able to Distinguish Between Types of Ammunition and Record Other Weapon Parameters, Such as Barrel Temperature**
- **Integration of WSC, UID, and Logistics Databases**

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Future of WSC Technology



Small Arms Room of the Future

Distribution Statement A - Approved for public release; distribution unlimited.



Questions or Comments?

Crane Navy
Special Weapons for Special Operators

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NSWC Crane

"Harnessing the Power of Technology for the Warfighter"

Presentation presented by:

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NATO OTAN

NATO Army Armaments Group





TOPICAL GROUP 3

on

Operations on Urban Terrain

NATO AC/225 TG/3

LtCol Eric de Saint-Salvy

Chairman

Situation

- **Terms Of Reference part of PFP(NAAG)D(2005)0021 dated 12 Sept 2005**
- **Level 2 Group report directly to NAAG**
- **Temporary group with 5 year mandate**

Goals

- **Exchange ideas and Urb Ops studies**
- **Determine areas for cooperation**
- **Express recommendations in its domain for NAAG and other groups**
- **Elaborate STANAGs if required**

Works

- Presentation of NATO and national doctrines
- Presentation of Lessons Learned
- Distribution of national documents
- Coordinate MOUT related efforts within other NATO bodies (LCGs)
  - Establish recommendations
  - Propose STANAG
- review prior work on capability gaps thanks to relevant bodies :
  - SNR(A) WG on Urb Ops
  - NATO FIBUA/MOUT WG
  - NATO R&T bodies
- LTCRs concerning Urb Ops

Assessment after three meetings

- **On the tracks :**
  - **Exchange on national doctrine**
  - **Exchange with ACT**
  - **Exhange with other NATO and SNR(A) bodies**

- **To start ASAP :**
  - **Exchange with other LCGs**
  - **Collect national documents**
  - **Identify capability gaps**
  - **Work on non lethal weapons**

A very large and very present topic

A new group to do the synthesis of all national skills or ideas



More to follow

Joint Service
Small Arms Technology Plan

May 9, 2007

2007 National Defense Industrial Association's
Joint Services Small Arms Systems Annual Symposium

Joint Service Small Arms Program Office
John Edwards
Program Management Officer

Why a Technology Plan

- Harmonizes/Coordinates Across Armed Services

  JSSAP Mission

- Consolidated Small Arms Science & Technology

  JSSAP Mission

  – Operational Based

  – PM Technology List (*total ownership cost*)

- Updated every 2 years

  JSSAP SOP

Joint Service Small Arms Technology Plan

Background

Requirements

- ***Joint Capabilities Integration Development System (JCIDS)***
- ***Joint Service Small Arms Capabilities Assessment (JSACA)***
- ***Small Arms Capabilities Based Assessment (CBA)***

- **Annual Historical JSSAP Funding $10-12 Million**

Outcomes

- ✓ ***Recommendations of Operational GAPS to <u>fulfill</u>***
- ✓ **Briefed Senior Army Leadership of Need for Additional Funding**
- ✓ ***$17 M Increase for Small Arms S&T Over Fiscal Year 08-13 Period***

Lightweight Small Arms Technologies

Current Technology Objectives:

- 35% Reduction in Weapon Weight
- 40% Reduction in Ammunition Weight
- Maintain or Improve Performance
- Demonstrate in Light Machine Gun

Payoff:

- Increased Mobility and Maneuverability
- Decreased Logistics Burden
- Reduced Training and Maintenance

Transition and Fielding:

- Transition to PM Soldier Weapons FY09-10
- Fielding in 2015+

Risk Level:

- Medium

Lightweight Machine Gun Concept



	M249	Goal	Caseless/CTA
Weapon	17.5 lb	11.4 lb	8.4/8.3 lb
Ammo (600 Rds)	20.4 lb	12.2 lb	10.2/13.2 lb
System (Wpn +Ammo)	37.9 lb	23.6 lb	18.6/21.5 lb

Development of Technology Plan





NSAC
INDUSTRY
ACADEME
GOVERNMENT

Combat Developer

Six Sigma

Materiel Developer

JSSAP Technology Bins

- Technical Fire Control
- Tactical Fire Control
- New Concepts & Applications
- Smart Munitions
- Warheads & Energetics
- Lethality & Utility
- Materials & Processes
- Modeling & Analysis

New JSSAP ATO's

Advanced Fire Control

Advanced Lethality

Technology Themes Based On Joint Synthesis Process

Joint Small Arms Capability Focus

- ***What is the problem?***
  Defilade threat targets are hidden behind objects and US forces use cover from defilade firing positions to engage targets. Identified in JCIDS Small Arms Assessment.

- ***What are the barriers to solving this problem?***
  Precision Engagement is limited due to small size payload effectiveness. Weight reduction and recoil are additional barriers requiring coincident breakthrough.

- ***How will you overcome those barriers?***
  Improvements to small fragmenting payloads through directionality and materials for increased effectiveness. Proximity Fuze small size technology application. Low weight recoil survival coupled with other weight reduction to deliver more effective payloads.

Technology Bin Recommendation: **Lethal Armament for Small Arms**

Joint Small Arms Capability Focus

- ***What is the problem?***
  Threat targets are moving and then seek cover behind objects. 60% of aiming is from an unsupported firing position.

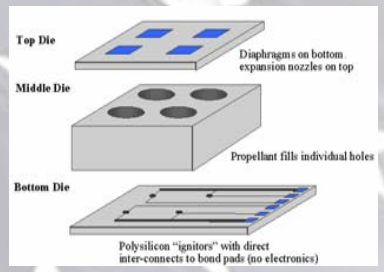
- ***What are the barriers to solving this problem?***
  Precision Engagement is limited due to tactical inaccurate range determination. Weight and multiple batteries required lead to lower weapon and reduced availability.

- ***How will you overcome those barriers?***
  Laser Steering with Auto Target Tracking or Laser imaging in relevant breadboard demo/experiments.

  Shared power source for low weight coupled with weapon imbedded sensors. Push weight from muzzle end to rear of weapon.

***Technology Bin Recommendation*: Technical Fire Control**

Planned Work Package for
Advanced Lethal Armament Technology for Small Arms





Note: Modeling & Simulations Activities are coincident with efforts

Schedule & Cost

Milestones	FY08	FY09	FY10
Advanced Lethality Component			
•Concept small warheads with modeling.	2		
• Experiment geometric & directionality warheads			
• Breadboard lethal & frag concepts comp.			4
• Miniature Proximity fuze electronics	3		
• Demo critical electronic comp.		4	
•Develop adv. recoil concepts	2		
• Tradeoff materials and recoil absorption technology. Experiment with recoil absorption		3	
•Critical breadboard of weapon launch survivability			4

Purpose:

To demonstrate advanced lethal armament component technology for providing improved munition effectiveness to targets.

Product:

- ***Demonstrate advanced lethality components spiraling to weaponization includes terminal effectiveness trades.***
- ***Miniaturize Proximity electronics for 40 mm application. Integration of improvement to SWAP of proximity fuze for small arms.***
- ***Demonstration of technical material components improving durability, reliability and weight to include Recoil attenuation technical advancement components***
- ***Modeling and Simulation assessments integrated with critical technology demonstrations***

Payoff:

- ***Multiple critical technology demonstrations enabling maturity measurement and component transition to Product Managers enhancing broad small arms capability gaps.***

Planned Work Package for

Advanced Fire Control Technology for Small Arms

Target Tracker &



Laser steering







Note: Modeling & Simulations Activities are coincident with efforts

Schedule & Cost

Milestones	FY08	FY09	FY10
Adv. Fire Control & Range Finding	2		
• *Concept Studies*			
• *Component Experimentation*			
• Component analysis/define parameters			
• Critical breadboard proof of concepts		3	
• Selection for breadboard fabrications			
• Integration of breadboard components			
• Component banding/maturation			4

Purpose:

To demonstrate advanced fire control component technology determining correct range to moving targets and further power sharing within weapon for current and future warfighters.

Product:

- ***Harvest and target, for small arms, the technologies of automatic target detection, laser steering to increase the soldier's ability to accurately determine range to non cooperative moving targets. Improved lethality in direct and indirect fire situations for unsupported firing positions.***
- ***Develop range determination overcoming man machine 1.5 hertz wobble human hold.***
- ***Investigate weapon wireless net centric access coincident with power sharing mounting rails.***

Payoff:

- ***Critical technology demonstrations enabling component transition to Product Mangers fulfilling broad small arms capability gaps.***

JSSAP Technology Base
Planned Implementation

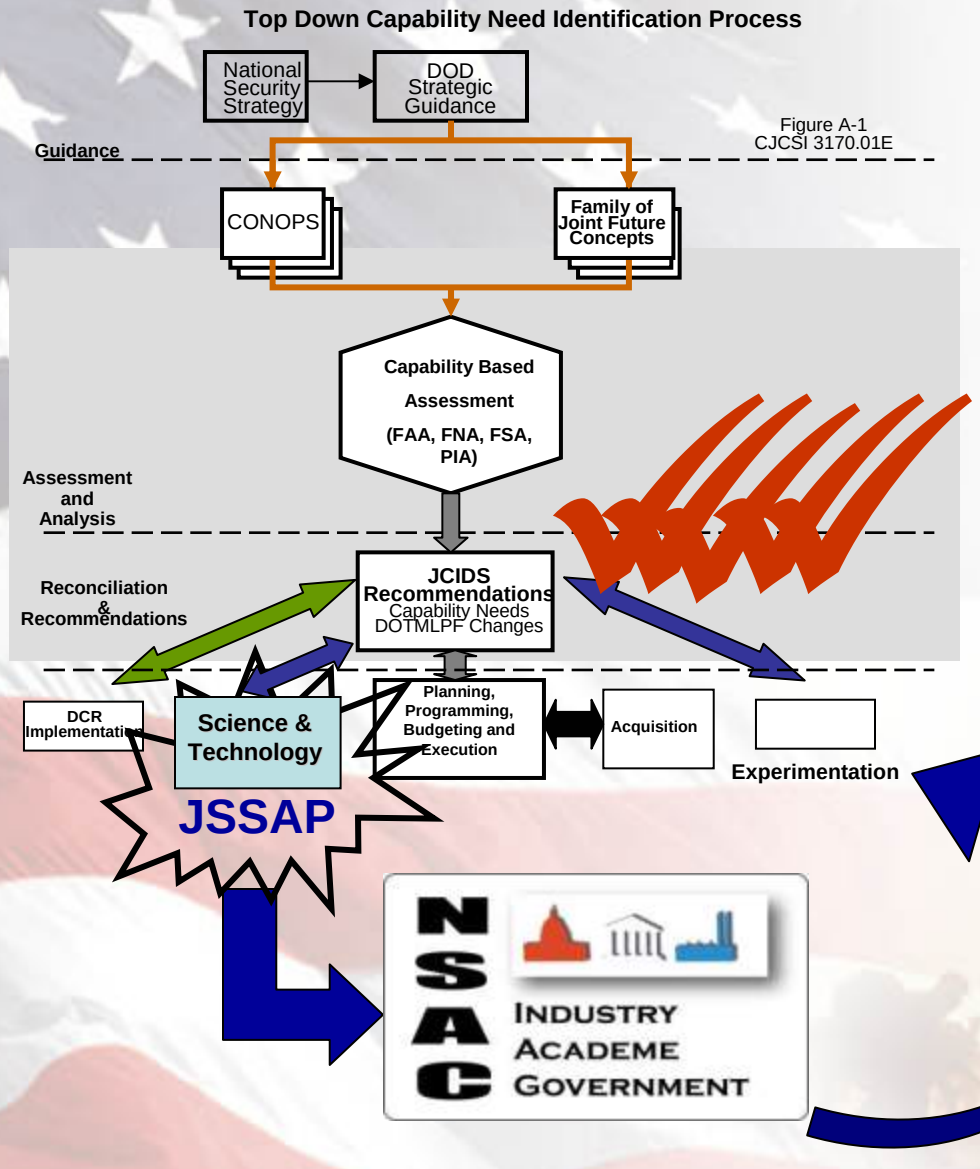
Technology Development Approach

- ***National Small Arms Center***

  Provides *Innovative* Industry & Academia Technologies

  - **Applied Research and Development for Small Arms**
    - **Consortium collaboration is beneficial**
    - **Promotes more ideas encompassing varying technologies and risk levels**
    - **Multiple JSSAP Tech Concept Agreements**
    - **"seed efforts" based on Request for Project Proposals**

JSSAP Tech Plan Implementation



Each OTA Effort successfully filling gaps

✓ ***Enhances the warfighters capability***

New Approach

More Opportunity

Faster Technology Response

Warfighter Focus

JSSAP Technology Activities

How Can You Get Involved?

Look for NSAC Request for Project Proposal (RPP)

1. Submit your ideas
   a. Alone
   b. Collaborate (Industry, Academia or Govt)
   c. Become NSATC member
2. Submit your ideas again and again

   See a. and b. above

JSSAP Tech Activities

Questions ?



NATO Army Armaments Group (NAAG) Quick Reaction Team (QRT) for Nonlethal Weapons

Presented by
MAJ. Kevin J. Finch

NATO QRT on Non-Lethal Capabilities Background/Charter

- NAAG Workshop on NonLethal Weapons (NLW) formed QRT - (Sep 06)
- Allied Command Transformation (ACT) broadened scope of QRT to NonLethal Capabilities (NLC) - (Dec 06)
- QRT Charter:
  - Analyze and review existing information
  - Establish NLW catalogue
  - Provide recommendations to address shortfalls
  - Provide recommendations for standardization
  - Provide proposals for other NATO group activities

QRT Methodology

- The QRT looked into the following main areas:
  - Why is a NLC required in NATO?
  - What is required to develop an NLC in NATO?
  - What are the NATO NLC shortfalls?
- Output was categorized as follows:
  - Policy: Policy, definitions, legal, ethical, presentational, National Caveats, etc.
  - Capability: Existing capability, capability requirements, shortfalls, opportunities for standardization, wider considerations, etc.
- There is a clear requirement for further work!

Policy Review

- There is a requirement for a policy review, to include:
  - Add a definition of NLC to existing policy
  - Conduct a legal review
  - Examine wider considerations, such as: ethical, presentational, Rules of Engagement, National Caveats, etc.
- Recommendation: To form a specific group, at the appropriate level within NATO, to conduct a policy review.

QRT Proposed NLC Definitions

QRT NL Capabilities Overview

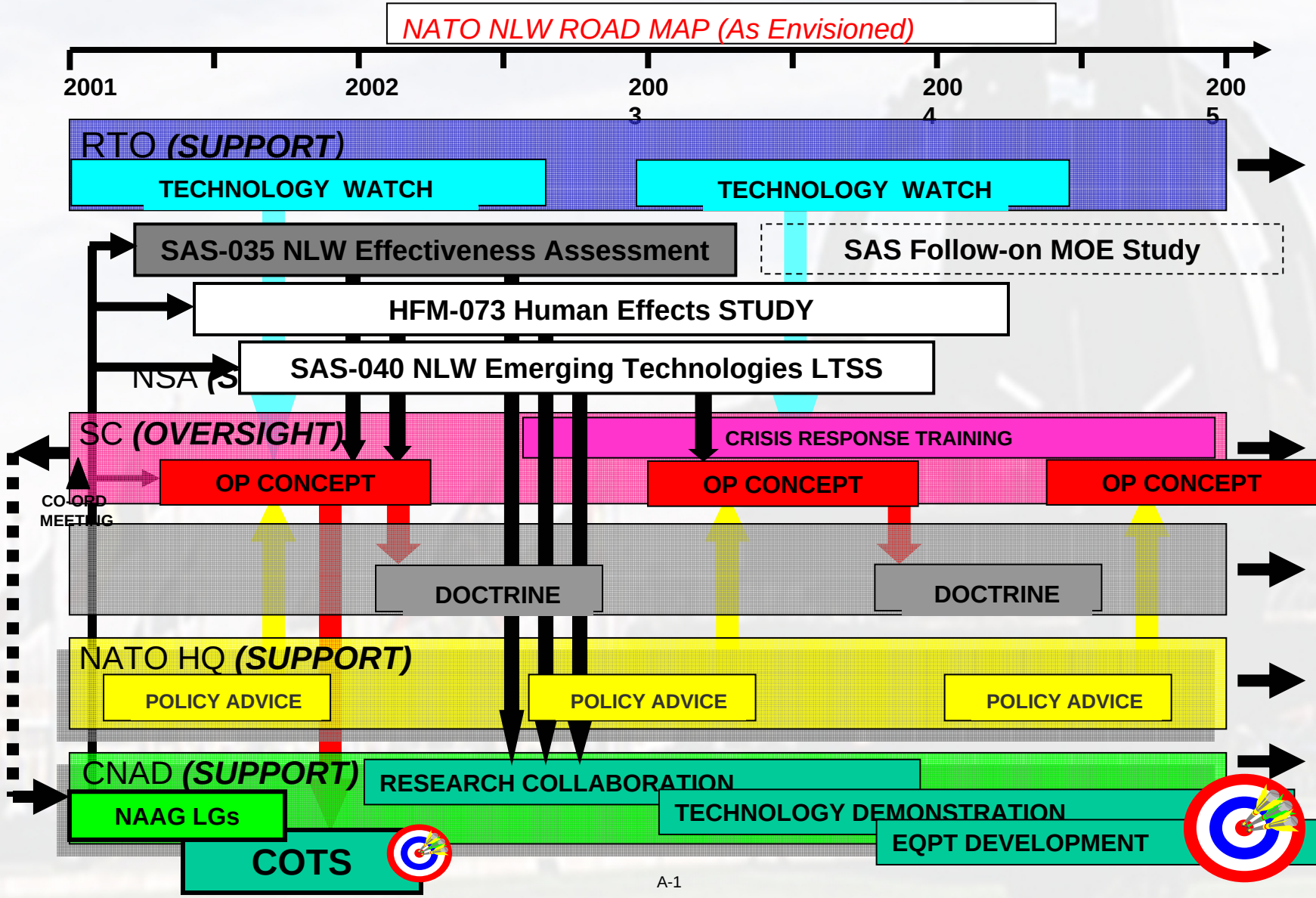
Capability Review

- There is a requirement for a joint capability review, to include:
  - Creation of an NLW catalogue.
  - Develop an NLC database
  - Identification of NLC shortfalls.
  - To examine capability across all lines of development (doctrine, training, personnel, etc.)
  - Opportunities for standardization.
- Recommendation: To form a specific joint group, at the appropriate level within NATO, to conduct a capability review.

NLC Catalogue

Shortfall Matrix

Execution Roadmap



Summary of Recommendations

- Request a Non-Lethal policy amendment.
- Form NATO groups to conduct.
  - Legal review
  - Capability review
- Empower a dedicated and joint NATO group with responsibility for NLC.
- Endorse a road map for implementation.

Questions?

Backups

QRT NLC Definitions

- ***The following definitions are offered for consideration by the Policy Review Group:***

- **<u>Definition of NLC (1) – QRT definition:</u>**

  A capability, designed and expected to achieve a relevant military effect on a person, equipment or infrastructure yet with a significantly lower risk of human fatality or permanent injury than could be expected from conducting the same task through the use of conventional systems (i.e. those designed with a high probability of lethality).

- **<u>Definition of NLC (2) – SAS-035 definition:</u>**

  Procedures, systems and equipment with a low risk of causing fatalities and permanent injury to personnel and undesired damage to property and the environment for use across the full range of operations; they augment the use or threat of the use of lethal force and provide commanders with wider options of delivering Fighting Power to achieve strategic, operational and tactical objectives.

NATO NL Capabilities Overview (Categories, SAS-35)

Electro-magnetic	Chemical	Acoustic	Mechanical/ Kinetic	Ancillary
ELECTRICALS Pulsed Current Direct Current **RADIO FREQUENCY** EMP Wide/Ultra Wide Band **MICROWAVE** High Power Microwave **MILLIMETER WAVE** **INFRARED** Lasers (COIL) CO2 HF/DF Solid State **VISIBLE** Lasers Lights **ULTRAVIOLET** Lasers **X-RAY**	**OBSCURANTS** Rapid Hardening Agents Smokes **REACTANTS** **MALODORANTS** **RIOT CONTROL** **ANTI-TRACTION** -Lubricants -Surfactants **FOAMS** **THERMOBARRIC** **NANOPARTICLES**	**AUDIBLE (20Hz-20kHz)** **AUDIBLE/OPTICAL** Flash Bangs **ULTRASOUND** **(> 20KHz)**	**BARRIERS** **ENTANGLEMENTS** Nets **CLOGGERS** **BLUNT IMPACT DEVICES** Projectiles Velocity Adjusting Water Stream	**MARKERS** Dyes Fluorescent Paints Taggers **NON-LETHAL CASINGS** Frangible Casings Combustible Casings **ENCAPSULANTS** Micro-encapsulation

*** These are possible technology types. Specific systems must comply with treaty and legal obligations.**

QRT NLC Shortfall Matrix (Example)

				NLW Category >		ELECTROMAGNETIC		MECHANICAL and KINE					
				Catalogue Entry	NLC SUMMARY	SUMMARY ELECTROMAGNETIC	Catalogue entries	KINETIC SUMMARY	Polymeric Impact Round (UK)	L65/ L5A7 polymeric Impact Round	blah	Hickory Sticks	Caltrops / Lazy Tongs / X net etc
Core Capability	Functional Area	Mission Task	More detail needed ?		x								
CP	CROWD CONTROL (CC)	CC SUMMARY			x								
		CC1 etc x 20			x								
CM	Deny Area to Vehicles (DV)	DV Summary					x		x				
		DV1 - Stop Veh urban	DV1a - 0-50m							x	x	x	x
			DV1b - 50+m		x			x					
		DV2 - Stop veh rural			x								
		DV3			x			x					
		upto DV 15			x			x					
	Disable/Neutralize Vehicles, Vessels, Aircraft &							x					
CC	Disable/Neutralize Facilities and Systems							x					
	Deny Use of WMD							x					

QRT NLC Catalogue (Example)

Ref #	Category	Capability	Description	Range (m)	Recommended Use	Country of Use	Mission	Producer	Model	Remarks
Ref # will be added when Dbase is complete.	Acoustic, Chemical, Electromagnetic, Mechanical and Kinetic, Ancilliary	Counterpersonnel (CP), Countermaterial (CM), Countercapability (CC)	What does system do? To who/what?		(CRC – Detainee handling etc..)			If relevant.		
1	Mechanical, Kinetic	CM	Stinger Strips	NA	Stop Vehicles by deflating tires.	USA				One time use
2	Mechanical, Kinetic	CM	Portable Vehicle Arresting Barrier (PVAB)	NA	Stop Vehicles. Net is deployed to trap vehicle. Stops a 3400 kg vehicle .	USA				Size: 1.2m L x 1.1m W x 1.1m H. Weight: 275 kgs. Bi-directional, covers single lane.
3	Mechanical, Kinetic	CM	Vehicle Lightweight Arresting Device (VLAD or XNET)	NA	Stop Vehicles. Spikes puncture tires and net wraps around vehicle front axle, bringing vehicle to a controlled halt. Stops a 3628 kg vehicle traveling 95 kph.	USA		QinetiQ, UK		Current system is man-packable and manually deployed. Self deploying system is under development. Uni-directional, covers single lane.
4	Chemical	CP	Hand Grenades with smoke generator - tear gas		Crowd and riot control. Force protection (sites and equipment). Always combine with lethal weapons (reversibility) as well as with passove defence assets (prevention, deterrence.)	France				Kosovo, Ivory Coast, Afghanistan
5	Chemical, Acoustic	CP	"Cougar" 56mm grenade launcher. Use against crowd with smoke generator-tear gas and deafening device.	50, 100, 200	Crowd and riot control. Force protection (sites and equipment). Always combine with lethal weapons (reversibility) as well as with passove defence assets (prevention, deterrence.)	France				Kosovo, Ivory Coast, Afghanistan
6	Mechanical, Kinetic	CP	"DBD" hand-grenades. Projection of rubber splinters.		Crowd and riot control. Force protection (sites and equipment). Always combine with lethal weapons (reversibility) as well as with passove defence assets (prevention, deterrence.)	France				Kosovo, Ivory Coast, Afghanistan
7	Optical, Acoustic	CP	40 mm, 4 x BANG M/03 (Sound and flash)	60-90 m	Distract crowd/individuals by 4 x bang (150 db)	Denmark		NICO	MAT #: 1310226084108, or 1370123658962	KFOR, OIF, ISAF RC-S
8	Mechanical, kinetic	CP	40 mm M/03 Rubber Buck Shot	40 m	Distract, incapacitate crowd/individuals	Denmark		NICO	MAT #: 13102261098	KFOR, OIF, ISAF RC-S

Project Manager Soldier Weapons Rapid Fielding Initiative (RFI) Update

Michael Friedman
Chief, Logistics and Integration Division

8 May 2007

Soldier Weapons RFI

- Bottom Line Up Front
- RFI has Made great progress in fielding
  - Over 890,000 Soldiers Fielded
- Industry has responded exceptionally
- Basis of Issue of Lethality Items is expanding to more types of soldiers
- Is Sustainable – path forward toward Standardization
- Is Accountable

Soldier Weapons Fieldings
(1 August 2002 – 1 May 2007)

893,197 Soldiers in 84 BCTs & 166 EABs Total

Item	FY05	FY06	FY07	Total Issued 11/02-4/07
Backup Iron Sight	72484	58800	61486	192770
M68 CCO	101370	86509	103357	291236
3 Point Sling	53855	100831	67728	222414
TA31F ACOG	5818	4180	7863	17861
M203 Day/Night sight	3176	7905	3560	14641
Modular Weapon System Kit (M4 and M5 ARS's))	9390	13776	5465	28631
M4 Forward Grip Bipod	2224	5150	2631	10005
M4 Improved Buttstock	2084	3836	2980	8900
M4/M16 Improved Cleaning Kit	2703	6607	4006	13316
M192 Lightweight Ground Mount	1207	2855	2197	6259
Improved Spotting Scope	416	773	136	1325
M24 Small Binoculars	24357	21395	17037	62789
M145 Machine Gun Optic	11082	6553	11370	29005
M249 Rail	10009	5378	10856	26243
M249 Short Barrel	8245	10971	8584	27800
M249/M240B Spare Barrel Bag	6297	9830	10158	26285
M249 Collapsible Buttstock	648	6955	3771	11374
M240B Rail	2347	217	717	3281
M240B Combat Ammo Pack	3907	4388	3875	12170

NSWC Crane

“Harnessing the Power of Technology for the Warfighter”

Distribution Statement A - Approved for public release; distribution unlimited.

USSOCOM SOPMOD - Miniature Day/Night Sight Development Program

8 May 2007

Presented by Mr. Barry Gatewood,
USSOCOM SOPMOD Deputy Program Manager



Distribution Statement A - Approved for public release; distribution unlimited.

NAVSEA WARFARE CENTERS CRANE

U.S. Special Operations Command SOPMOD

NDIA NATIONAL DEFENSE INDUSTRIAL ASSOCIATION
STRENGTH THROUGH INDUSTRY & TECHNOLOGY

Presented to NDIA Small Arms Symposium

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SOPMOD Program Updates & Accomplishments

Distribution Statement A - Approved for public release; distribution unlimited.

SOPMOD Mission

The SOPMOD Program Management Office at NSWC Crane, IN, will provide standardized, versatile weapons accessories to meet needs across SOF mission scenarios. These accessories will increase operator survivability and combat effectiveness by enhanced weapon performance, target acquisition, signature suppression, and fire control.

The SOPMOD PMO will provide these accessories when they are operationally suitable, affordable, sustainable, and funded.



Distribution Statement A - Approved for public release; distribution unlimited.

SOPMOD Client Weapons

1995-2002

SOPMOD ORD 5 - Core Small Arms (Threshold) ...Design For Use On:

M4A1 Carbine
M203 Grenade Launcher

May 7th, 2002

ORD Annexes – CDD Format
Additional Weapons (Objective)
....Harden For Use On, and develop versions for:

SCAR
Mk 12
CQBR (Mk 18)
M14 and Mk 14 Enhanced Battle Rifle
AK-47/AK74 Series Assault Rifle
MK46 LMG / M249 SAW Machineguns
MK48/M240-N/M240/M240-B Machineguns
M2-HB .50 Cal Machinegun
Mk44 Minigun
Mk-19 40mm Machinegun
M72 LAW
AT4-CS
MAAWS
MK11, MK13, & MK15 Sniper Rifles
M-24 Sniper Rifle

SOPMOD Weapons of Interest

Limited SOPMOD Interest in Lasers – Passive Aiming Generally Covered by INOD Program (AN/PVS 22/26)

Distribution Statement A - Approved for public release; distribution unlimited.

Capabilities Required

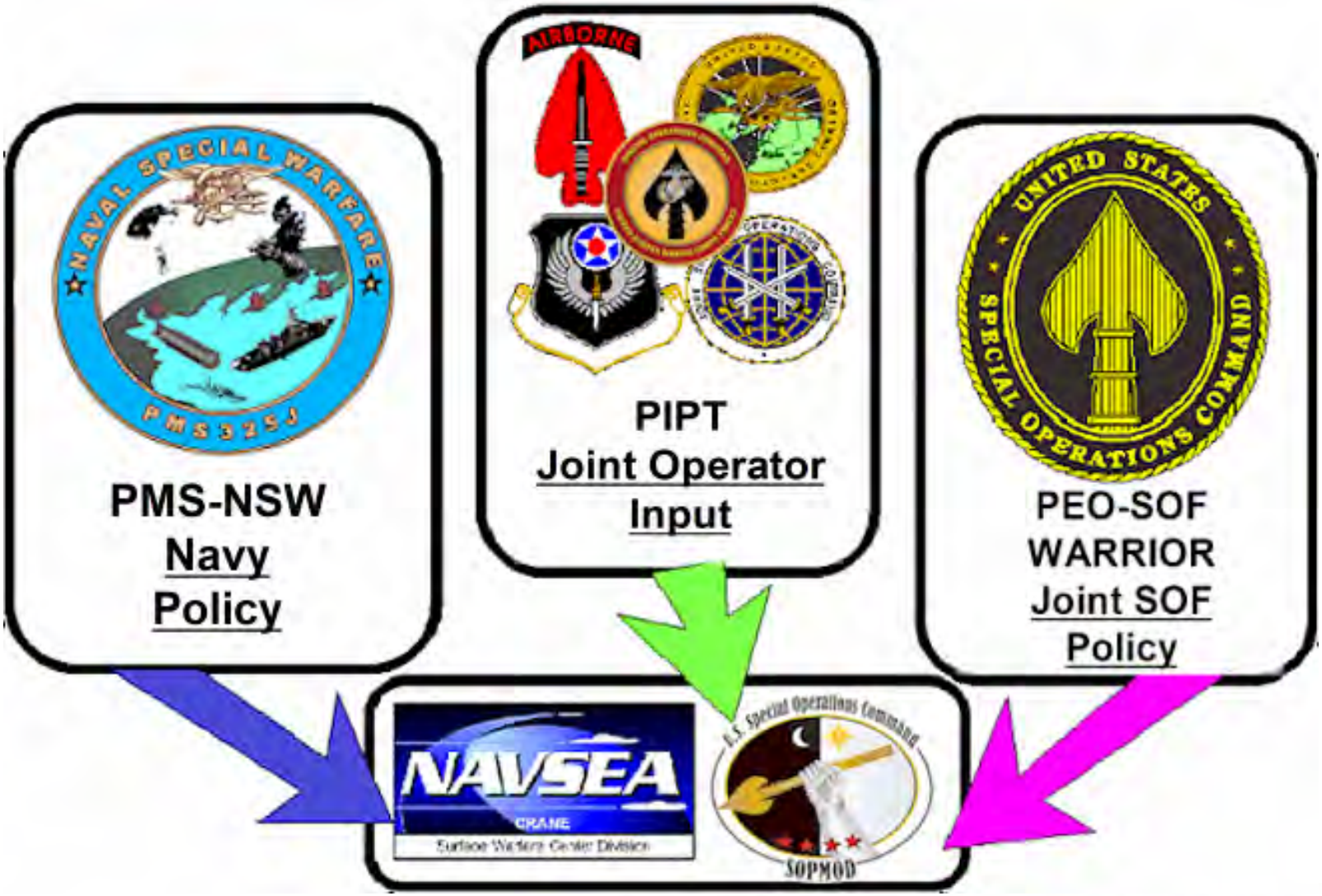
- Standardized versatile weapons accessories
- Modular- meets needs across SOF mission scenarios
- Increased operator survivability and combat effectiveness by enhanced target acquisition, signature suppression, and fire control



- Evolutionary Acquisition Subprograms:
  - Block I (Plus Platform Mods and Phased Replacements)
  - Block II (New and Combined Capabilities)
  - Block III (Emerging Capabilities & Crew Served)

Distribution Statement A - Approved for public release; distribution unlimited.

SOPMOD Guidance



Distribution Statement A - Approved for public release; distribution unlimited.

Crane Future Task Organization



Fielding & Sustainment

PEO-SW FTT | SOF LCSMs | O-Level Course

ALGL PMO



RD&A & ISEA

USSOCOM Program Group?

RD&A & ISEA

SOVAS PjM

RD&A & ISEA

RD&A & ISEA

RD&A & ISEA

SOF Wpns PMO

SOPMOD PMO

SOF Shoulder Fired



Distribution Statement A - Approved for public release; distribution unlimited.

SOPMOD Sub-Program Structure

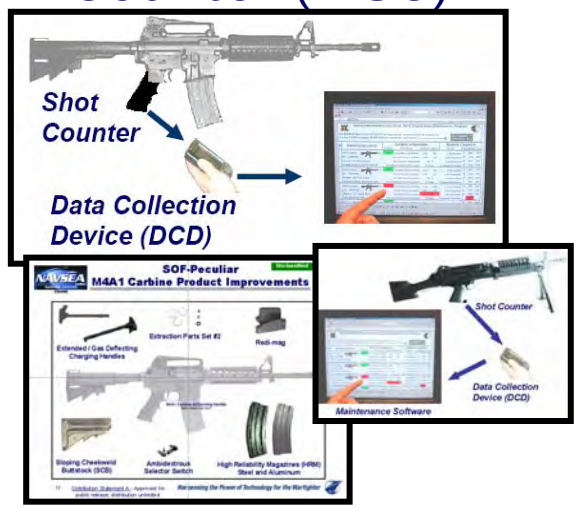
SOPMOD Sustainment



Miniature Day/Night Sight (MDNS) Development



Weapons Performance & Shot Counter (WSC)



Distribution Statement A - Approved for public release; distribution unlimited.

SOPMOD Block 1



Distribution Statement A - Approved for public release; distribution unlimited.

SOF-Peculiar
M4A1 Carbine Product Improvements



Distribution Statement A - Approved for public release; distribution unlimited.

USSOCOM PEO-SW / SOPMOD Accomplishments (1)



- **Joint Weapon Accessory System Currently Used By Army Special Forces, Army Rangers, Navy SEALS, Air Force Special Tactics & USMC Special Operations.**
- **Integrated Day And Night Aiming and Signature Suppression System**
  - **20 Varieties Of Subsystems**
  - **6 Varieties Of Minor Items And Parts Sets**
- **Miniaturized Lights, Lasers, Optics, Image-Intensification Night Vision, Thermal Imaging, And Sound Suppressors**

Distribution Statement A - Approved for public release; distribution unlimited.

USSOCOM PEO-SW / SOPMOD Accomplishments (2)



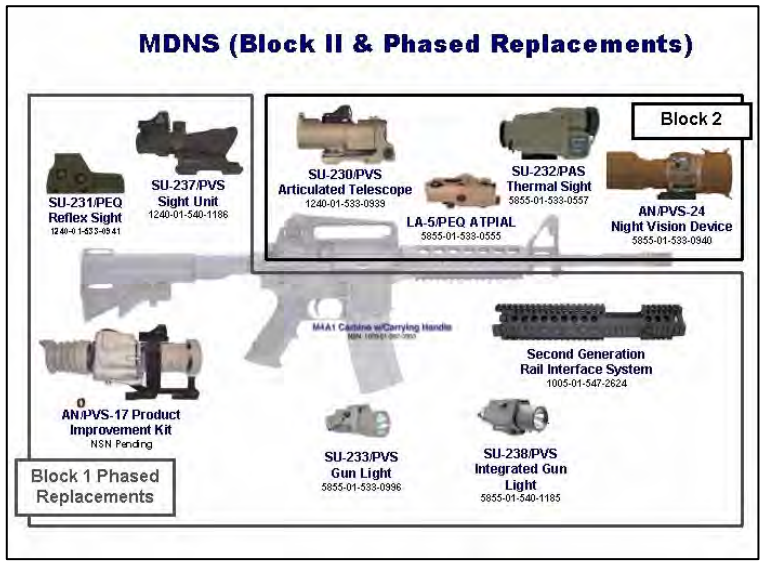
- 110,092 Total End Items Fielded To Joint SOF Forces-Currently Used In GWOT, with xxxxx End Items Currently In-Transit
- Over $196 Million Awarded On Contracts To Date
  - Additional $175M Programmed For Future Fielding
  - 10 Block II Subsystems, over 74,000 items in current production runs
  - 6 Emerging Block III Systems
- Cradle-To-Grave Life Cycle Support To Customers, Controlled Through DoD Registry, Sustained Through A Joint Special Operations Logistics System
- Full Program Under One Roof at NSWC Crane.

Distribution Statement A - Approved for public release; distribution unlimited.

Miniature Day/Night Sight (MDNS) Development

Distribution Statement A - Approved for public release; distribution unlimited.

MDNS Mission Statement



The SOPMOD Program Management Office will utilize the Miniature Day/Night Sight (MDNS) Development Program to focus on phased replacements to current SOPMOD Block I items and the acquisition of new Block II items to reflect the latest innovations in optical sighting technology. Items procured through the MDNS Development program will address shortcomings in currently fielded equipment and seek to field smaller, more rugged equipment suitable for a variety of weapons platforms.

Distribution Statement A - Approved for public release; distribution unlimited.

MDNS Goals

- **Update Aging Technology on Current SOPMOD Items**
- **Address Possible Improvements in Current SOPMOD Kit Items**
- **Miniaturize and Ruggedize SOPMOD**
- **Integrated System Approach**
- **Encourage Innovation through Competition**
- **RDT&E + Modified NDI: Best of Both Worlds**
- **Meet Objective Fielding Requirements for SOPMOD Kits**

Distribution Statement A - Approved for public release; distribution unlimited.

MDNS (Block II & Phased Replacements)

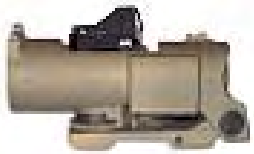
Block 2



SU-231/PEQ Reflex Sight
1240-01-533-0941



SU-237/PVS Sight Unit
1240-01-540-1186



SU-230/PVS Articulated Telescope
1240-01-533-0939



SU-232/PAS Thermal Sight
5855-01-533-0557



LA-5/PEQ ATPIAL
5855-01-533-0555



AN/PVS-24 Night Vision Device
5855-01-533-0940



AN/PVS-17 Product Improvement Kit
NSN Pending

Second Generation Rail Interface System
1005-01-547-2624



SU-233/PVS Gun Light
5855-01-533-0996



SU-238/PVS Integrated Gun Light
5855-01-540-1185

Block 1 Phased Replacements

Distribution Statement A - Approved for public release; distribution unlimited.

Acquisition Recap

- **Feb 02** — **$1.5M RDTE Unrequested CPU**
- **Mar 02** — **Commercial Agency Announcement Published**
- **Feb 03** — **Solicitation Opens**
- **Apr 03** — **USSOCOM Approves Performance Spec**
- **Apr 03** — **Solicitation Closes**
- **Jun 03** — **Phase 1 Step 2 Oral Presentation/Demonstration**
- **Mar 04 - Sep 05** — **Contracts Awarded**
- **Dec 04** — **USSOCOM Approves ORD Annex**
- **Aug 04 - May06** — **OT/DT/ECPs**
- **May 06** — **USSOCOM ADM Approved: Full Rate Production**
- **Jul 07** — **Commence TPF ($90M Value to Date + $90M Additional Through FY13)**

Distribution Statement A - Approved for public release; distribution unlimited.

SOPMOD Sustainment Sub-Program

DESCRIPTION



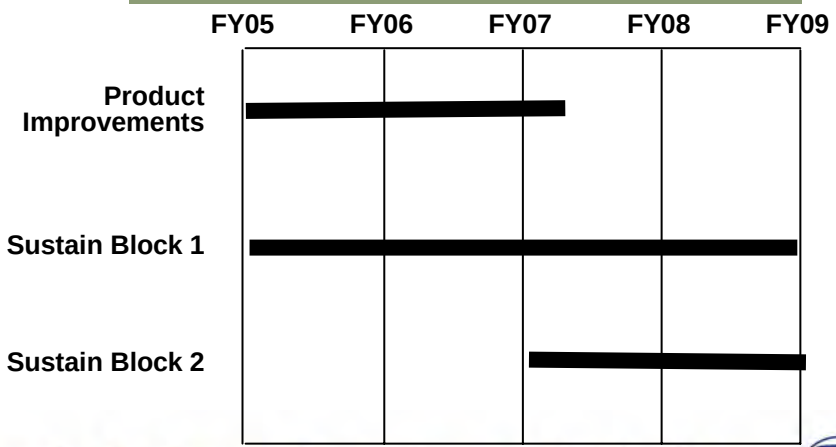
PERFORMANCE CHARACTERISTICS

- Program Status: GREEN
- standardized, versatile weapons accessories to meet needs across SOF mission scenarios
- increased operator survivability and lethality by enhanced weapon performance, target acquisition, signature suppression, and fire control

APPROXIMATE BUDGET PROFILE

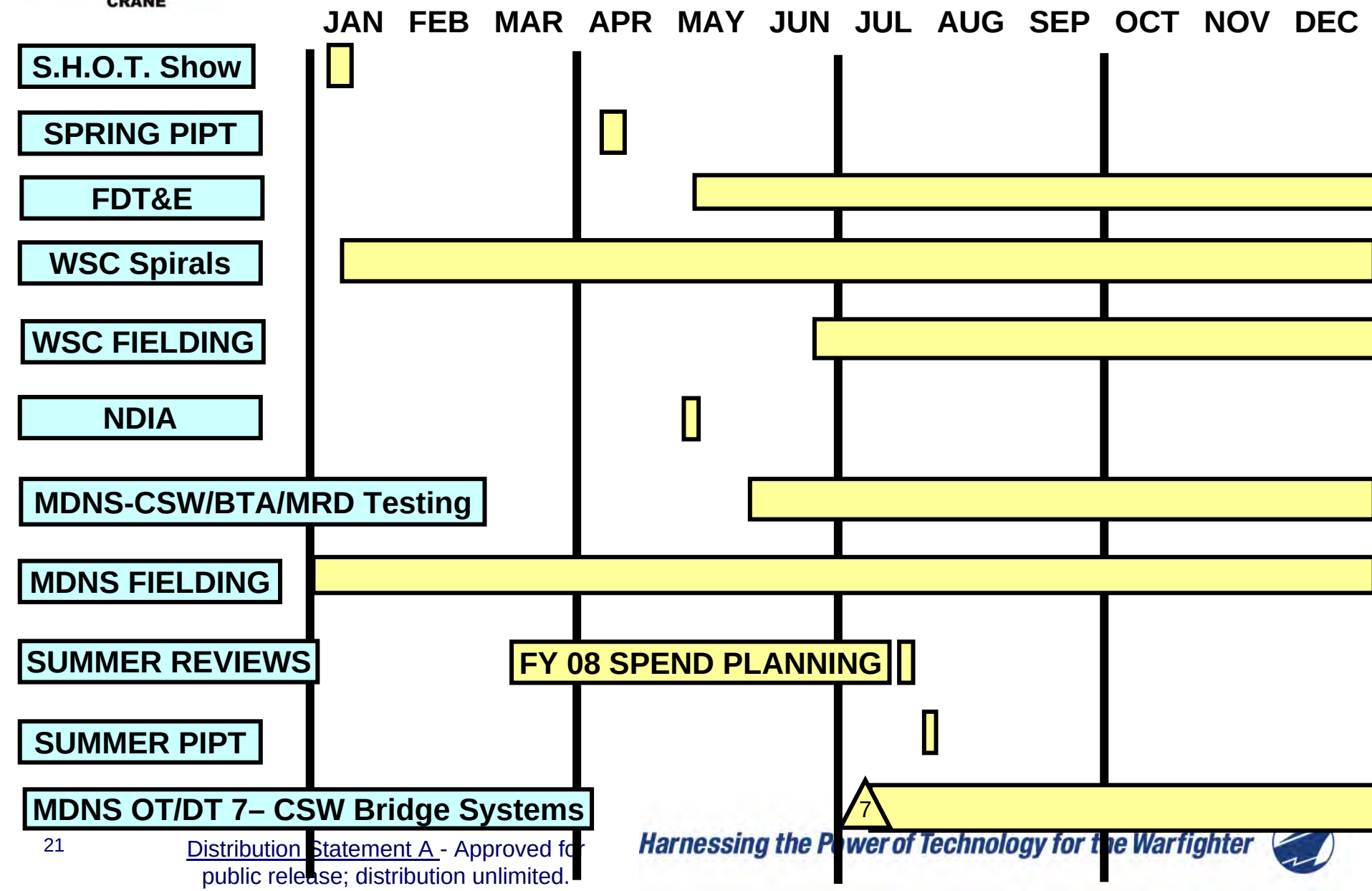
- FY-95 to Present, Invested:
  - $11M R&D
  - $173M Procurement
  - $21M O&M
- Planned Sustainment of Current and Future Systems through FY13:
  - $65M O&M

KEY MILESTONES/ ACTIVITIES



Distribution Statement A - Approved for public release; distribution unlimited.

SOPMOD 2007
MACRO CALENDAR



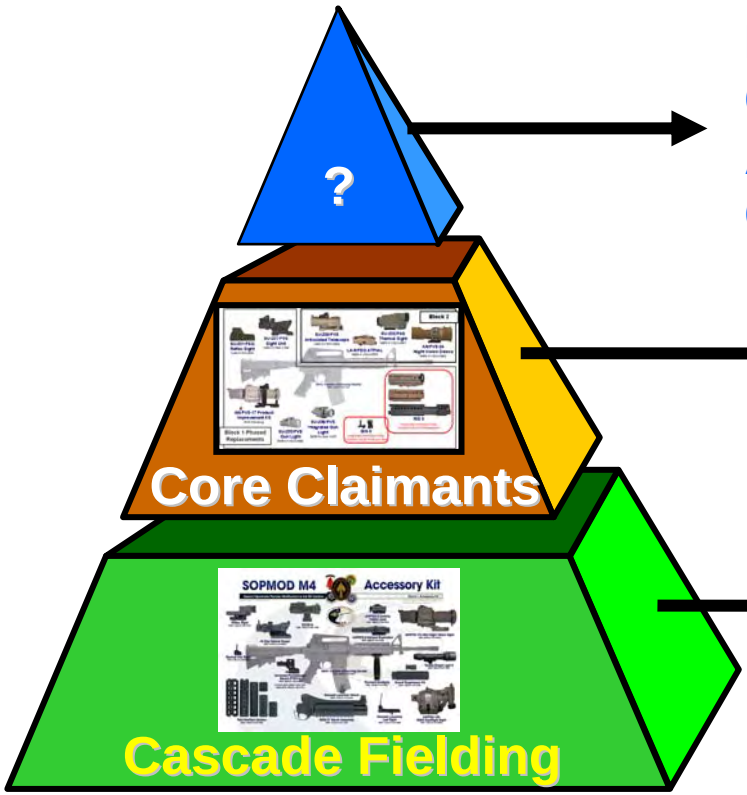
Distribution Statement A - Approved for public release; distribution unlimited.



SOPMOD ACQUISITION TOP MAP

Distribution Statement A - Approved for public release; distribution unlimited.

TOP MAP STRATEGY



Increment III - Fielding 2007-?
Capstone of Emerging Capabilities
And Filling Capability Gaps, Especially
Crew-Served Weapons

Block II - Fielding 2005- 2010
System Integrated Capabilities
Teamed with All SOF Weapons

Block 1 - Fielded 1995-2005
COTS/NDI Capabilities
Teamed with M4A1 Carbine & M203

Distribution Statement A - Approved for public release; distribution unlimited.

TOP MAP STRUCTURE

- **Overview Top Map Shows Entire System at a Glance**
- **Five Detailed SOPMOD Accessories Top Maps Show Main Subsystem Categories**
    1. **Carbine Improvement Subsystems**
    2. **Passive Day Aiming Subsystems**
    3. **Passive Night Aiming Subsystems**
    4. **Active Aiming Subsystems**
    5. **Weapons Shot Counter Subsystems**

Distribution Statement A - Approved for public release; distribution unlimited.

SOPMOD ACQUISTION TOPMAP OVERVIEW

NAVSEA WARFARE CENTERS CRANE

U.S. Special Operations Command SOPMOD

Existing Systems **Emerging Systems** **Objective Systems**

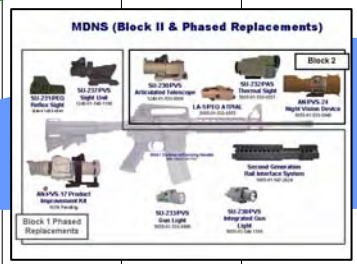
2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015

SOPMOD ACCESSORY KIT OVERVIEW

SOPMOD Increment #1 (1994-2007+)



SOPMOD 1
1994-2012



SOPMOD 2: MDNS & WSC
2004 -2012+

SOPMOD 3
2007-Onward

SOPMOD 1 & 2 Compatible With both M4A1 Carbine and SCAR

SOPMOD 3 Compatible With All SOF Weapons

Distribution Statement A - Approved for public release; distribution unlimited.

Harnessing the Power of Technology for the Warfighter

SOPMOD ACQUISTION TOPMAP
Carbine Improvement Subsystems

Existing Systems | **Emerging Systems** | **Objective Systems**

2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015

USSOCOM ORD Amendment 5, 29 October 1999

MDNS CDD 16 December 2004



RIS 1



RIS 2



BIS 1

System Life Ends When M4A1 Carbine Life Ends

CDR USSOCOM Directive May 1999



HRM (Alum)



HRM (Steel)
Managed By ARMY



Slings, Ambidextrous Safety, Stock, Cases, Small Parts, Etc.

Distribution Statement A - Approved for public release; distribution unlimited.

SOPMOD ACQUISTION TOPMAP
Passive Day Aiming Subsystems

NAVSEA WARFARE CENTERS CRANE

U.S. Special Operations Command SOPMOD

Existing Systems | **Emerging Systems** | **Objective Systems**

2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015

USSOCOM ORD Amendment 5, 29 October 1999

MDNS CDD 16 December 2004



ECOS-H



ECOS-GL Reflex Sight



ACOG Reflex



SU-231/PEQ Reflex Sight



ECOS - N



SU-237 Sight Unit



ACOG 4x



SU-230/PVS Articulated Telescope

Distribution Statement A - Approved for public release; distribution unlimited.

Harnessing the Power of Technology for the Warfighter

SOPMOD ACQUISTION TOPMAP
Passive Night Aiming Subsystems

NAVSEA WARFARE CENTERS CRANE

U.S. Special Operations Command SOPMOD

Existing Systems | **Emerging Systems** | **Objective Systems**

2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015

USSOCOM ORD Amendment 5, 29 October 1999

MDNS CDD 16 December 2004



Weapon-Specific MNVS (e.g.. Crew Served)



MNVS AN/PVS-17A

MRD-PIP



AN/PVS-17A PIP



CNVD-H



Universal Pocketscope Mount



Clip-on Night Vision Device – I2



CNVD Sensor Fusion



Clip-on Night Vision Device - Thermal

Distribution Statement A - Approved for public release; distribution unlimited.

Harnessing the Power of Technology for the Warfighter

SOPMOD ACQUISTION TOPMAP
Active Aiming Subsystems

Existing Systems | **Emerging Systems** | **Objective Systems**

2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015

USSOCOM ORD Amendment 5, 29 October 1999

MDNS CDD 16 December 2004



ITPIAL
Carbine AN/PEQ-2



CVL
AN/PEQ-5



CSHWAL
CONCEPT IMAGE

Crew-Served and Heavy Weapons Aiming Laser



ATPIAL
Spirals: Ultra-High Power and Wireless Controls



VBL-H and M
CONCEPT IMAGE



VBL 2 PIP

VBL – Medium And Heavy



VLI



VBL 2





VBL 3

SU-233/PVS and SU-238/PVS Gun Lights

Distribution Statement A - Approved for public release; distribution unlimited.

SOPMOD ACQUISTION TOPMAP
Weapon Shot Counter Subsystems

Existing Systems | Emerging Systems | Objective Systems

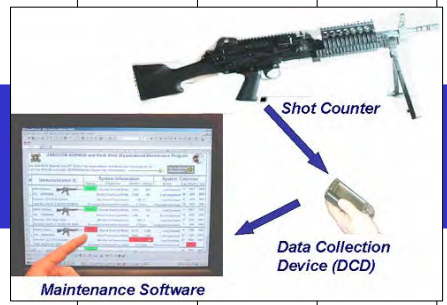
2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015

WSC CDD approved 16 Dec 2004

SOST Prototypes



WSC - Carbine



WSC – Machinegun andSniper



WSC – Future Weapons

Distribution Statement A - Approved for public release; distribution unlimited.



CNVD-SF CONCEPT IMAGE



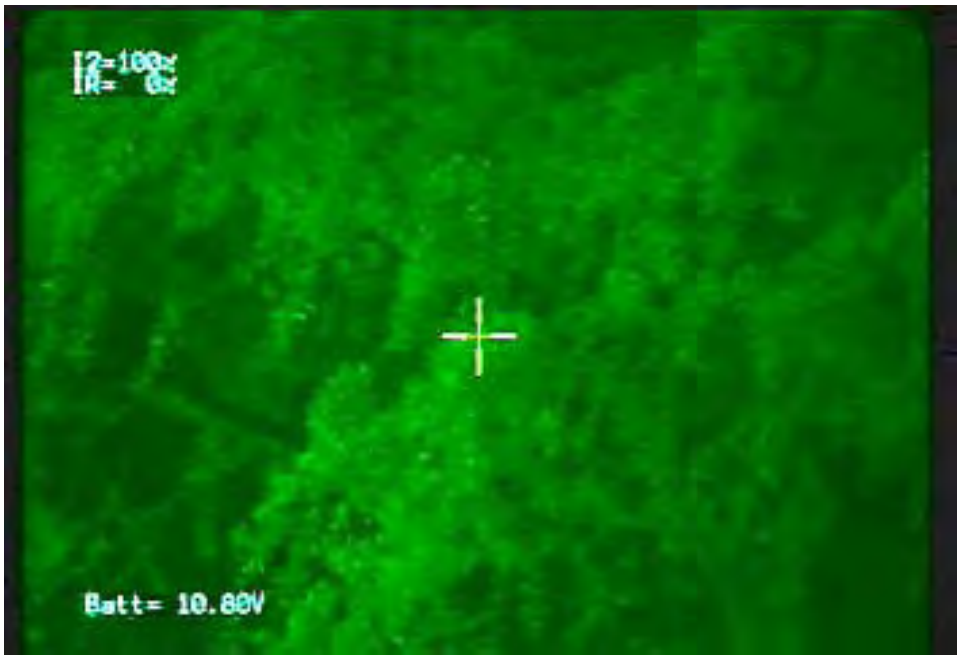
Initial Objectives:

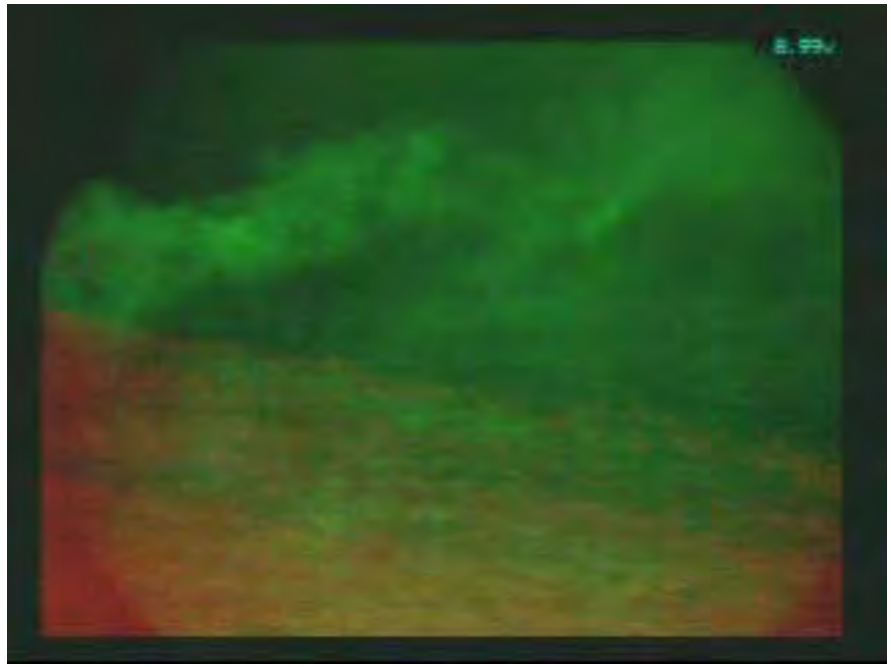
- Improved Target Acquisition
- Less than 2 Pounds
- Less than $30K Per Copy, Objective less than $10K
- Technology Readiness Assessment Complete
- Draft Specification and Acquisition Strategy Published, Open for Public Comment until End of June 2006

Distribution Statement A - Approved for public release; distribution unlimited.

CNVD-SF

Videos Courtesy of
Litton EOS
Garland, TX





Distribution Statement A - Approved for public release; distribution unlimited.

BASELINE SYSTEM (1)



- New Capability
- Significant Size/Weight Reduction (24 oz)
- Improved Target Detection Capability
- For Use as CNVD or Stand-Alone
- 1X-2X Zoom
- Dual Video Output, VGA and RS 170
- Throw Lever Mount
- Improved OLED for Enhanced Performance
- Potential CNVD-Sensor Fusion Spiral Development
- Contract N00164-04-D-4840 Awarded to Insight Technology

Distribution Statement A - Approved for public release; distribution unlimited.

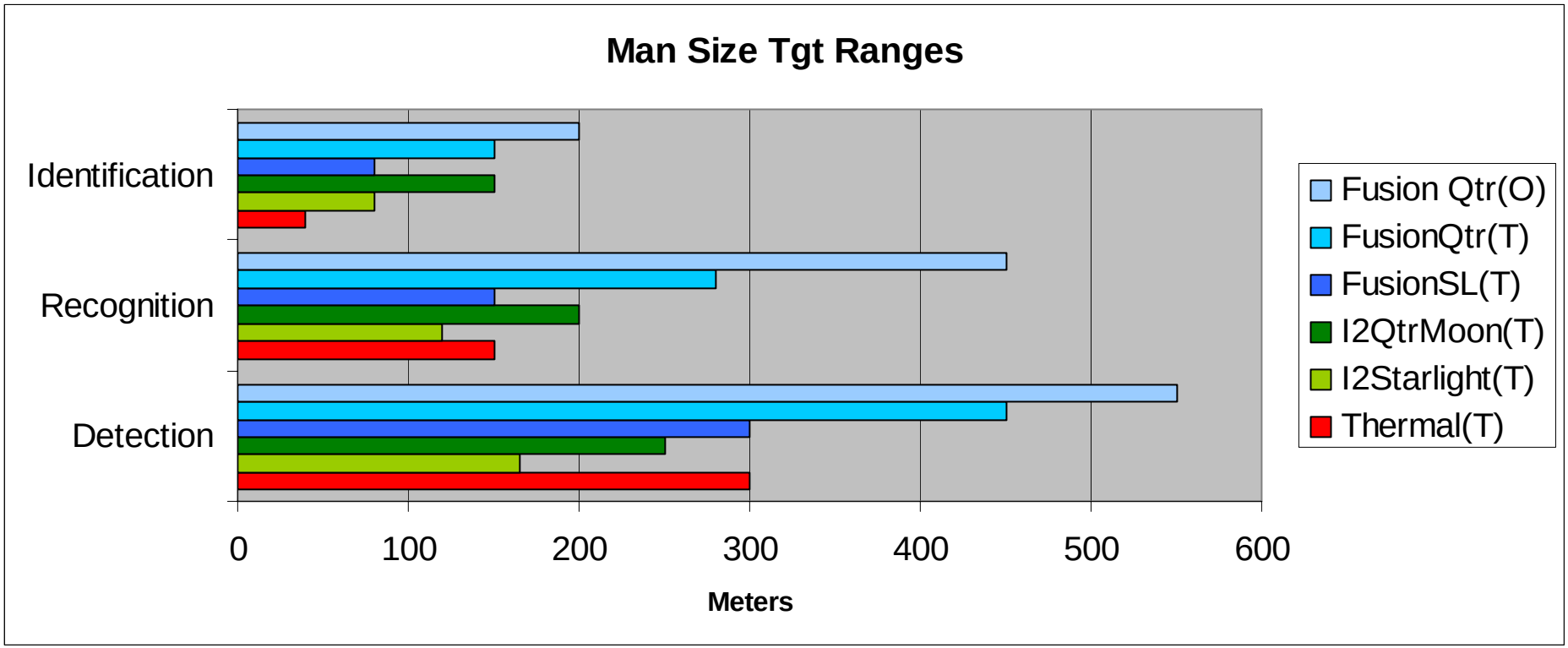
BASELINE SYSTEM (2)



- Original ORD 5 Block II
- Sized and Scaled for Use on Carbines and Light Machineguns
- Gen III OMNI V Auto-Gated Image Tube
- Lightweight (app 24 oz)
- Improved Zero Retention for Day Scopes
- Contract N00164-04-D-4839 Awarded to Litton

Distribution Statement A - Approved for public release; distribution unlimited.

Detection, Recognition and ID



Distribution Statement A - Approved for public release; distribution unlimited.

CNVD-SF Schedule

- Publish Solicitation: Spring 2007
- Perform Technical Evaluation: Winter 2007
- Contract Award: Spring 2008
- Developmental/Operational Testing: Winter 2008
- Full Rate Production: 2010

Distribution Statement A - Approved for public release; distribution unlimited.

Miniature Red Dot (MRD)



- Provides Attachable CQB Capability to Existing SOPMOD Sights
- SOPMOD Currently Utilizes Docter® Sight
- Improvements Desired:
  - Needs Durability to Meet All SOF Combat Requirements
  - Waterproof up to 66 Feet
  - Easier Battery Change

Distribution Statement A - Approved for public release; distribution unlimited.



SOPMOD Program Support to Force Development Test & Experimentation

Distribution Statement A - Approved for public release; distribution unlimited.

MDNS - CSW

PHASE 1: FDT&E leads to User Assessment – NAVSPECWARCOM N-42 Tests for Urgent COTS Bridge Contracts

PHASE 2: Full Fair and Open Competition leads to Formal OT&E – Fully Integrated Modular System

Distribution Statement A - Approved for public release; distribution unlimited.

Weapons Of Interest



M2HB



MK44 Minigun

Distribution Statement A - Approved for public release; distribution unlimited.

Weapons Of Interest



M240B



M240D



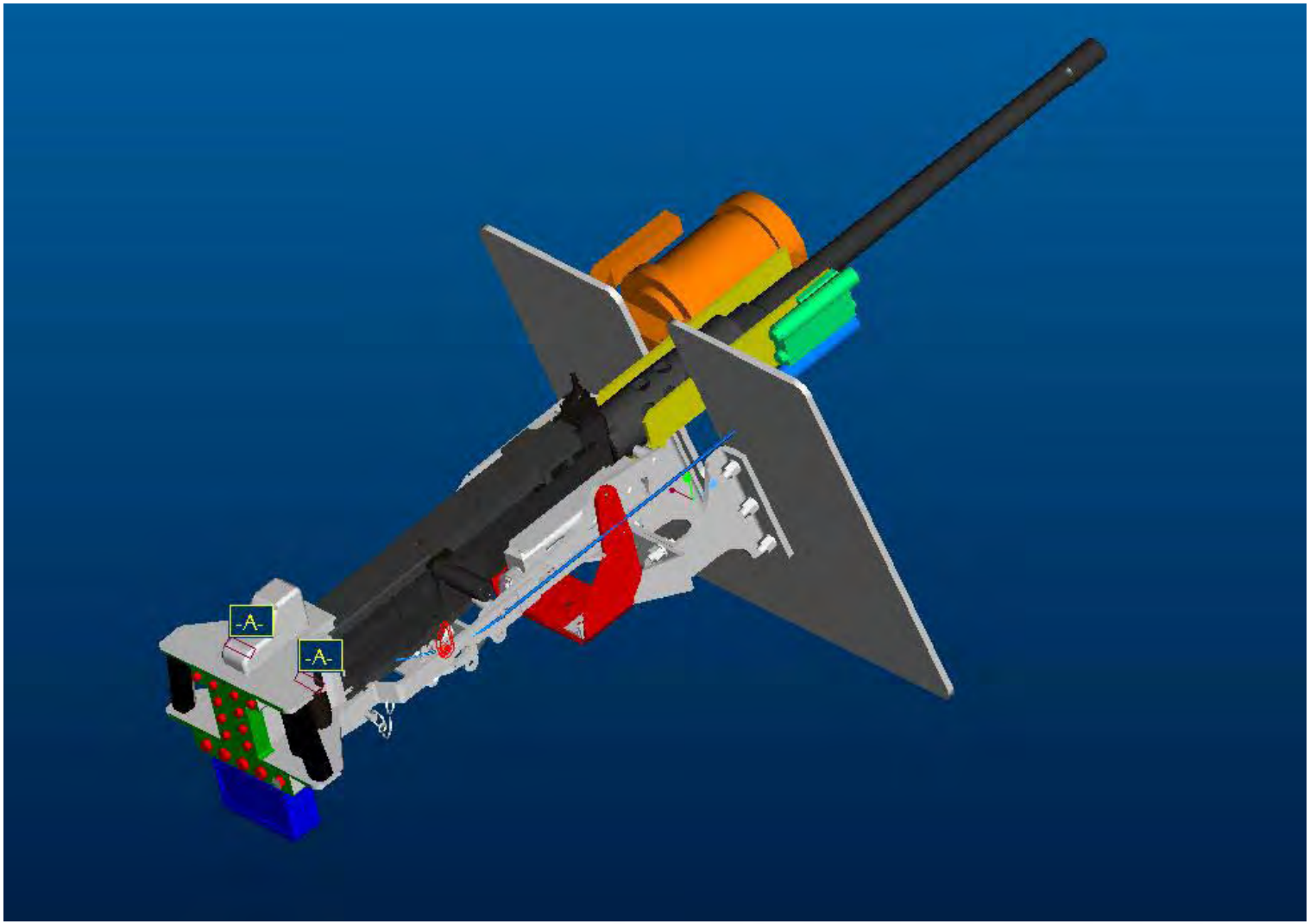
M240N



Mark 48

Distribution Statement A - Approved for public release; distribution unlimited.

MDNS-CSW Concept



Distribution Statement A - Approved for public release; distribution unlimited.

New Technology Drivers

- Continuous Automatic Ranging Scopes
  - With Corrected Aim Points
  - Some Bernoulli Factors Applied (Less Wind)
- Autonomous Target Recognition Tied To Triggering
- Rain Shedding Coatings
- Adaptive Optics
- Wind Full Vectors (Someday)
- Barrel Cooling Technologies
- Full Signature Suppression

Distribution Statement A - Approved for public release; distribution unlimited.



NIGHT

We Own It

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USSOCOM SOPMOD Program Manager

NSWC Crane

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Email: lucius.taylor@navy.mil

Barry Gatewood

USSOCOM SOPMOD Deputy Program Manager

NSWC Crane

Commercial: (812) 854-3842, DSN 482-3842

Email: barry.gatewood@navy.mil

Distribution Statement A - Approved for public release; distribution unlimited.

NATO Small Arms Ammunition Interchangeability via Direct Evidence Testing

2007 NDIA Joint Service Small Arms Systems Annual Symposium

Lascelles A. Geddes III
U.S Army ARDEC &
U.S. Delegate to NATO NAAG AC/225 (LCG/1 – SG/1)

9 May 2007

NATO Sub-Group 1 Mission

- The mission of SG/1 is to accomplish and maintain battlefield interchangeability of NATO small and medium caliber ammunition (and ancillary items) through direct evidence testing at NATO Certified Test Centers

Sub-Group 1 Structure

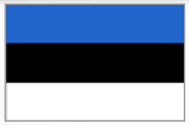

Austria


Belgium


Canada


Czech Republic


Denmark


Estonia


France


Germany


Greece


Hungary

Chairman Colonel Dirk Hemeryck (BELGIUM)

International Military Staff

Secretary SG/1 NATO Land Armaments


United States


United Kingdom

European Regional Test Center - ERTC (Pendine, Wales, UK)

ERTC Superintendent

26 Member National Delegates & Several PFP National Delegates

National Support Staff & Ammunition/ Weapon Manufacturers

North American Regional Test Center - NARTC (Independence, Missouri, USA)

NARTC Superintendent


Italy


Turkey


Iceland


Switzerland


Sweden


Spain


Slovenia


Slovakia


Romania


Norway


Netherlands


Lithuania

What is Interchangeability?

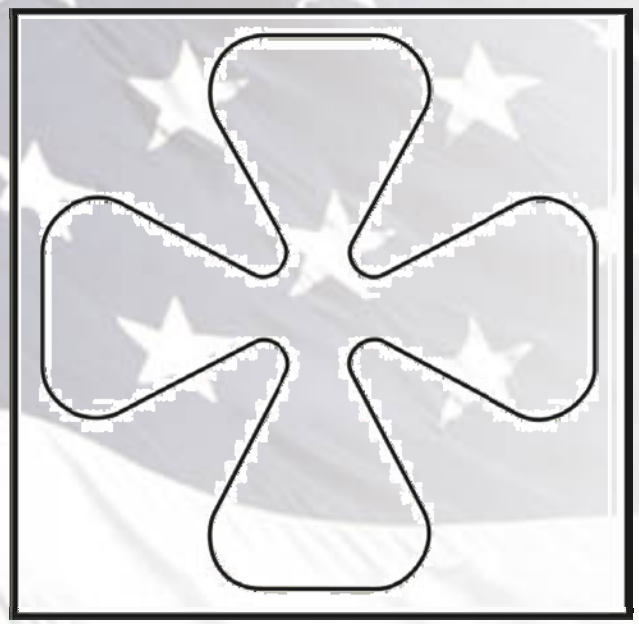
- **Interchangeability** – Items possessing similar functional and physical characteristics that are equal in performance, and capable of being exchanged one for the other without alteration
  - Interoperability – The ability of systems, units or forces to provide services to and accept services from other systems, units or forces and to use the services so exchanged to enable them to operate effectively together
    - Compatibility – Capability of two or more items or components of equipment or material to exist or function in the same system or environment without mutual interference
      - Standardization - Within NATO, the process of developing concepts, doctrines, procedures, and designs to achieve and maintain the most effective levels of compatibility, interoperability, interchangeability and commonality in the fields of operations, administration and materiel

NATO Design Mark

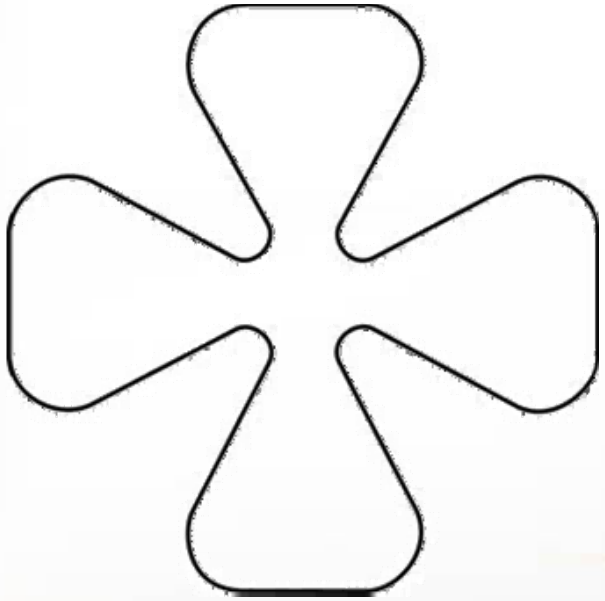


The NATO Design Mark signifies that ammunition and ammunition in packages bearing this mark is manufactured to a design, which satisfies a NATO Standardization Agreement (STANAG)

NATO Symbols of Interchangeability



Cartridge & Link



Cartridge Only

The NATO Symbol of Interchangeability is the only symbol that denotes that the packaged ammunition is interchangeable

Accomplishing Battlefield Interchangeability

- Guidance from higher levels within NATO (NAAG, LCG/1)
- Develop technical requirements
- Develop test and inspection methods
- Conduct direct evidence testing to:
  - Qualify ammunition designs
  - Monitor designs in production
  - Check designs in storage
- Authorize the use of the NATO Symbol of Interchangeability
- Develop solutions to technical and procedural problems within the ammunition community

Battlefield Interchangeability Requirements

- Proper Weapon Function
- Safety of Gunner
- Adequate Terminal Effectiveness

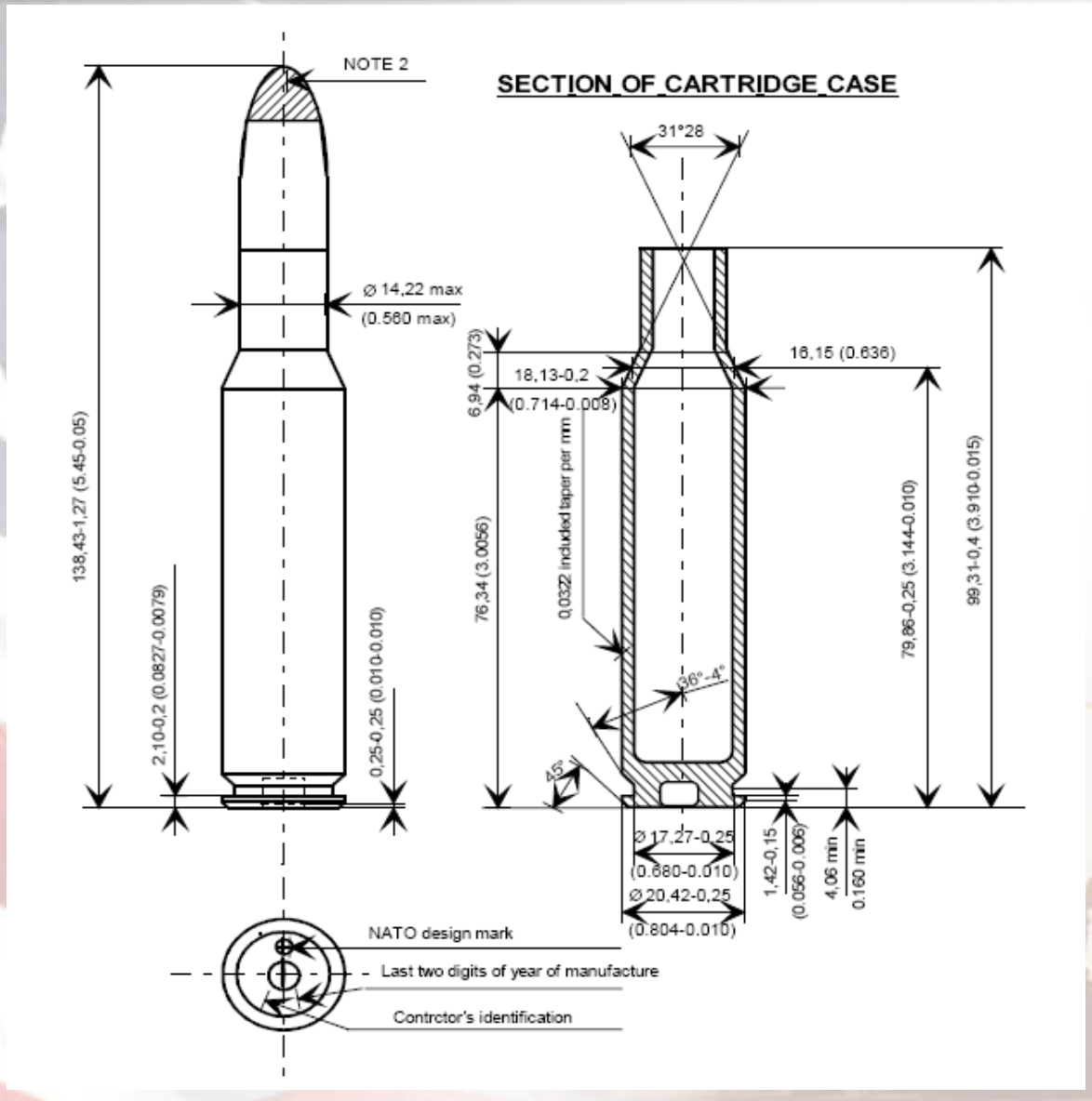
Without The Need For :

- Weapon Adjustments
- Sight or Fire Control Adjustments
- Range or Mission Limitations
- Ammunition Repack

NATO Standardization Agreement (STANAG)

- A STANAG is an agreement among several or all NATO nations to standardize, for the use of the NATO Armed Forces, the essential characteristics of various small and medium caliber linked ammunition types to ensure interchangeability on the battlefield
- Each STANAG contains performance requirements only, it does not address sample sizes or accept/reject criteria
- Each STANAG contains drawings outlining the exterior cartridge and case dimensions and characteristics
- STANAGs are NOT intended to be utilized for acquisition
- STANAGs are NOT intended to take the place of a national specification

Standardization Drawing



Manual Of Proof & Inspection (MOPI)

- There is an accompanying MOPI for each STANAG (caliber)
- The MOPI details the type of testing to be conducted to ensure that the ammunition meets the requirements of the appropriate STANAG
- The MOPI prescribes the uniform test methods, inspection procedures and equipment needed to perform the subject testing/inspection
- The MOPI includes sample sizes and accept/reject criteria for each test/inspection
- Sub-Group 1 is the only group within NATO to create and utilize these manuals to ensure functional interchangeability on the battlefield
- The NATO MOPIs are used throughout government/industry and have become THE standard for test procedures in the ammunition community

NATO Qualification Approval (QA)

- Conducted once for each ammunition design (and link if applicable) to confirm compliance with the STANAG & MOPI
- The submitting NATO nation shall have declared the ammunition design safe and suitable for use by their armed forces and have already procured or produced the ammunition
- A NATO design number identifies the qualified design and then the submitting NATO nation is granted authority to apply the NATO Symbol of Interchangeability to the outer pack of all ammunition
- It is NOT possible for manufacturers or non-NATO nations to submit ammunition for NATO QA testing

Application







NATO Production Test (PT)

- Conducted yearly to ensure that production of qualified designs continues to comply with the STANAG
- If a sample is not submitted, then current/future production cannot be marked with the NATO Symbol
- When more than one manufacturer produces the same qualified design, a sample from each manufacturer must be submitted for separate PTs
- SG/1 maintains an official list of qualified designs which also shows if the design is active (in production) or passive (no longer in production)
- Each NATO nation must complete a National Activity Report which demonstrates their level of activity
- It is NOT possible for manufacturers or non-NATO nations to independently submit ammunition for NATO Production Testing

NATO Production Test Failures

- Failure of the ammunition to meet the STANAG & MOPI requirements will result in the following:
  - Suspend the NATO qualified status of the ammunition produced since the last successful PT
  - Prohibit the use of the NATO Symbol of Interchangeability until a new sample has passed the PT
  - Remove the NATO Symbol of Interchangeability or constrain/ quarantine the affected ammunition from issue to any NATO multi-national forces
  - Present the results of the failed PT to SG/1 for a decision on the acceptability of previous production and use of the NATO Symbol of Interchangeability on following production
  - Submit a new PT sample when issue has been resolved/corrected

NATO Surveillance Test

- Conducted after specified storage intervals (10, 15, 20 years) to ensure that ammunition bearing the NATO Symbol of Interchangeability continues to meet NATO requirements

- Failure of the ammunition to meet the NATO requirements requires the NATO nation to remove the NATO Symbol of Interchangeability or constrain/quarantine the affected ammunition from issue to any NATO multi-national forces

How SG/1 Proves Interchangeability

- Interior Ballistics
  - Chamber & Port Pressure / Velocity / Action Time
- Exterior Ballistics
  - Precision / Trace / Trajectory Match / Penetration
- Manufacturing Quality
  - Waterproof / Bullet Extraction / Residual Stress
- Energetic Materials
  - Propellant & Primer Analysis / Primer Sensitivity
- Weapon Function

Tests Conducted For NATO Small Caliber Ammunition

QUALIFICATION	PRODUCTION	SURVEILLANCE
PRECISION	PRECISION	PRECISION
FUNCTION & CASUALTY	FUNCTION & CASUALTY	FUNCTION & CASUALTY
EPVAT	EPVAT	EPVAT
TRACE	TRACE	TRACE
BULLET EXTRACTION	BULLET EXTRACTION	
RESIDUAL STRESS	RESIDUAL STRESS	
PENETRATION	PENETRATION	
WATERPROOF	WATERPROOF	
SALT SPRAY/CORROSION	SALT SPRAY/CORROSION	
PRIMER SENSITIVITY	PRIMER SENSITIVITY	
TEMP (HIGH/LOW)	TEMP (HIGH/LOW)	
PROPELLANT AND PRIMER ANALYSIS	PROPELLANT AND PRIMER ANALYSIS	
BARREL EROSION		
TRAJECTORY MATCH		
CLIMATIC STORAGE		

NATO Regional Test Centers



North American Regional Test Center (NARTC)

(Co-located at the Lake City Army Ammunition Plant, Independence, Missouri, USA)

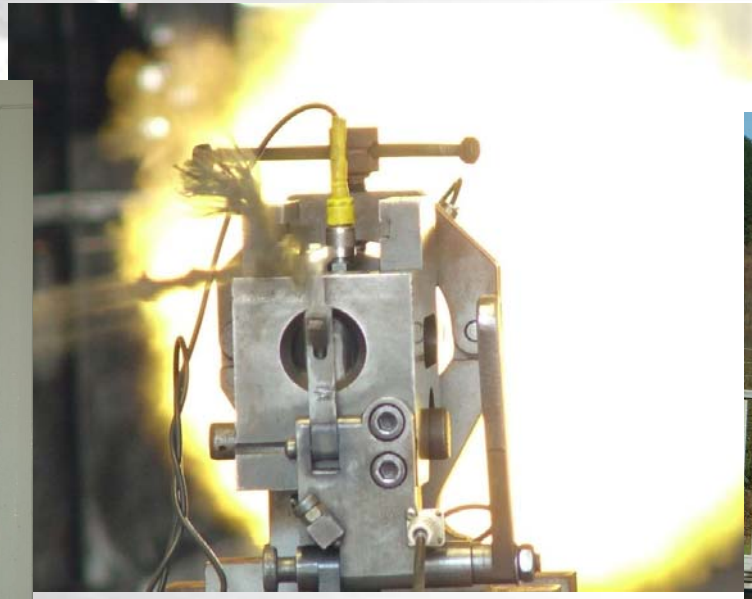
European Regional Test Center (ERTC)

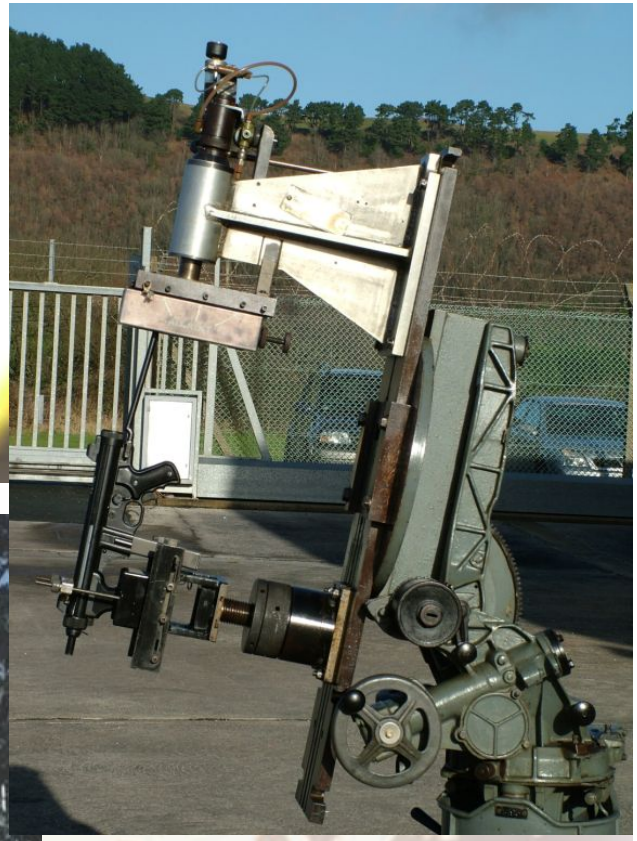
(Pendine, Wales, U.K.)

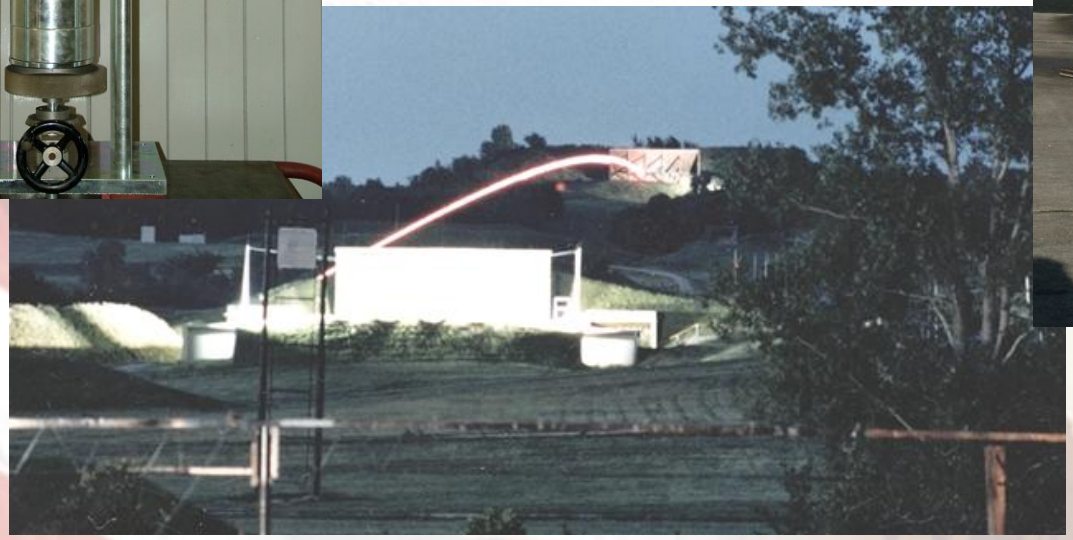


NATO RTCs









NATO National Test Centers

- National Test Centers (NTCs) are certified by caliber
- NTCs are inspected by the RTC Superintendents & staff
- NTCs are approved by SG/1
- NTCs may conduct the following:
  - Range Standardization Testing
  - New/Replacement Equipment Evaluations
  - New National Design verification against STANAG & MOPI criteria
  - Existing design verification prior to PT submission to RTC
  - NATO Surveillance Testing
- There are currently 12 NATO Certified National Test Centers

Function & Casualty Test

- One of the most important, informative tests for SG/1
- Proves that a foreign ammunition design will work in foreign weapon systems
- Conducted with NATO Nominated Weapons (NNW)
- Test samples are fired through each NNW at -65°F, 72°F, and +125°F
- Test samples are fired in both semi-auto and automatic mode (where applicable)

9mm NATO Nominated Weapons





Belgium – FN Browning Hi Power Pistol

Italy – Beretta 92F Pistol



Italy – Beretta 12S Sub Machine Gun

5.56mm NATO Nominated Weapons





Belgium – FN Minimi Machine Gun





Belgium – FN FNC Rifle





Italy – Beretta AR 70/90 Rifle

5.56mm NATO Nominated Weapons (cont.)



Germany – H&K G36 Rifle



United States – Colt M16A2/A4 Rifle



United Kingdom – H&K L85A2 Rifle

7.62mm NATO Nominated Weapons



United States – M240B Machine Gun
(Pending NNW Evaluation)



United Kingdom – Enfield L7A2 General Purpose Machine Gun

12.7mm NATO Nominated Weapon



United States – General Dynamics M2 Heavy Barrel Machine Gun

25mm NATO Nominated Weapons





Netherlands - Oerlikon KBA-B02AB
Automatic Cannon

United States – ATK M242 Bushmaster
Automatic Canon

40mm High Velocity NATO Nominated Weapons

Note: All pending NNW Evaluation



Spain – Santa Barbara SB LAG-40 M2
Automatic Grenade Launcher



United States – General Dynamics MK19
MOD3 Automatic Grenade Launcher



United States – General Dynamics MK47
Advanced Lightweight Grenade Launcher

Potential NATO Nominated Weapons

- Other potential NATO Nominated Weapons under discussion with ongoing standardization efforts

- 30mm x 173
  - ATK MK44 Bushmaster II Automatic Cannon
  - Mauser MK30-2

- 40mm x 46 LV
  - Colt M203 Launcher (12” Barrel)
  - Colt Canada M203A1 Launcher (9” Barrel)
  - H&K AG36 Launcher

SG/1 Current Thrusts

- 30mm & 40mm Low Velocity Grenade Ammunition Standardization efforts underway
- Development of a Multi-Caliber MOPI for 5.56mm, 7.62mm, 9mm and 12.7mm near completion
- Resolving technical issues with 40mm High Velocity STANAG and MOPI
- RTC/NTC facilitization for 12.7mm and 40mm HV ongoing
- Each NATO nation completes a National Fielded Weapon Survey to ensure that the family of NATO Nominated Weapons is well represented with weapons currently in the field

Sub-Group 1 (SG/1) History

- 1957 – 7.62mm ammunition STANAG 2310 ratified
- 1959 – 1st NATO Qualification of 7.62mm Ball (Canada)
- 1962 – 9mm ammunition STANAG 4090 ratified
- 1964 – 1st NATO Qualification of 9mm Ball (Belgium)
- 1969 – 7.62mm link STANAG 2329 ratified
- 1981 – 5.56mm ammunition STANAG 4172 ratified
- 1985 – 25mm x 137 ammunition STANAG 4173 ratified
- 1987 – 1st NATO Qualification of 5.56mm Ball (U.S.)
- 1993 – 1st NATO Qualification of 25mm HEI-T/TP-T (U.S.)
- 1997 – 12.7mm (Caliber .50) ammunition STANAG 4383 ratified
- 2002 – 40mm x 53 High Velocity Grenade Ammunition STANAG 4403 submitted for ratification
- 2006 – 30mm x 173 ammunition STANAG 4624 awaiting ratification
- 2007 – 40mm x 46 Low Velocity Grenade Ammunition STANAG being drafted

SG/1 Record Of Activity

- To date 95 ammunition designs have been NATO Qualified submitted by 12 different NATO nations
  - 5.56mm – 24 Designs
  - 7.62mm – 47 Designs
  - 9mm – 22 Designs
  - 25mm – 2 Designs



- 22 NATO nominated national weapon systems from 8 different NATO nations (many of these weapons are utilized in many other armed forces around the world)



SG/1 Designs by Caliber

- STANAG 2310 – Small Arms Ammunition (7.62mm)
  - 9 Active Designs
  - 19 Passive Designs
  - 19 Obsolete Designs
- STANAG 4090 – Small Arms Ammunition (9mm Parabellum)
  - 5 Active Designs
  - 13 Passive Designs
  - 4 Obsolete Designs
- STANAG 4172 – 5.56mm Ammunition Linked (Or Otherwise)
  - 12 Active Designs
  - 12 Passive Designs
- STANAG 4173 – 25mm x 137 Ammunition
  - 2 Active Designs
- STANAG 4383 – 12.7mm (0.50) Ammunition Packed As Linked Belts
  - 6 Pending Designs

Other SG/1 Accomplishments

- Implemented 6215 Pressure Transducer, now industry standard
- Highlighted design problems with various weapon systems
  - UK L85A1 Rifle ejection problems led to mid-life improvement program
  - Italy AR-70/90 Rifle magazine issues led to redesign of Beretta magazine
  - Spanish CETME-L Rifle defects due to fluted chamber led to NNW withdrawal
  - French NF1 Machine Gun barrel design problems led to NNW withdrawal
- 5.56mm Minimi Machine Gun Dovetail Standardization for Linked Ammo Packs

NATO Small Arms Ammunition Interchangeability Benefits

- Supports NATO and Coalition Warfare – Forces operate side by side more than ever before
- Supports the need for small arms ammunition which is integral in current operations
- Provides significant ammunition stockpile multiplier - The available world market for small arms ammunition is becoming smaller every day
  - Significant participation from non-NATO nation ammunition manufacturers
- Provides Logistic, Strategic and Tactical Advantages
  - NATO Nations Do Use Each Other's Ammunition Successfully as Evidenced Through Experience in Bosnia / Afghanistan / Iraq
- Many nations only purchase NATO Qualified Ammunition Designs and NATO Nominated Weapon Systems

Conclusion

- NATO Small Arms Ammunition – one of the most important and widely used items on the battlefield and in peace-keeping operations
- SG/1 is the only group within NATO which actually demonstrates the ability of a foreign weapon system to function safely and satisfactorily with another nation's ammunition
- SG/1 offers continuous proof through direct evidence of the ability to interchange ammunition to NATO soldiers on the battlefield



Questions?



Baselining of the 40mm Family of Ammunition

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8 May 2007

Overview

- Reason for Baselining
- Spark Range Testing
- Firing Tables Testing
- EPVAT with Soft Recovery
- Warheads Testing
- System Effectiveness Modeling & Simulation
- Benefits & Warfighter Payoff

Reason for Baselining

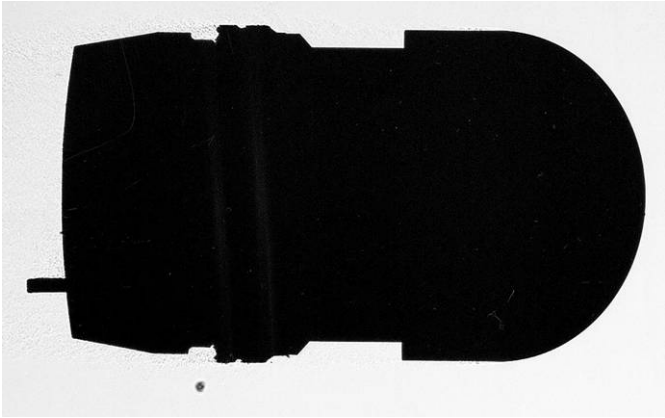
- 40mm Family of Ammunition
  - Low Velocity – M203 GL & XM320 GL
  - High Velocity – Mk19 GMG
- Why Baseline?
  - Establish robust ballistic & warhead performance database
    - Improve support to the User
    - Identify strengths and weaknesses of system
  - Improve engineering capability
    - Production Support
    - Ammo-Weapon Interface Issues
    - Producibility Enhancements & Technology Upgrades
- Objective – Provide the Warfighter Superior Capability
  - Enhance design, performance, reliability, quality & availability

Spark Range Testing

- Spark Shadowgraph Range
  - Orthogonal cameras placed at fixed intervals along trajectory
  - Photographs positional and angular orientation of the projectile
  - A "spark" provides back lighting & shadow
- 6-DOF motion models used to reduce data.
  - Provides aero coefficients, stability parameters and other characteristics
  - Parameters needed for projectile design, diagnostic studies and corrected aeroballistic models



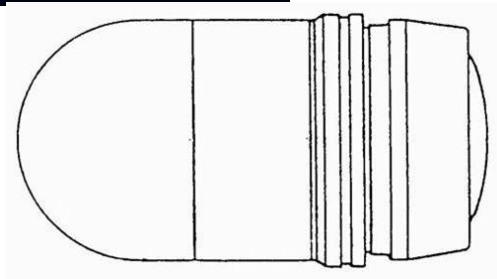
ARL Spark Shadowgraph Range



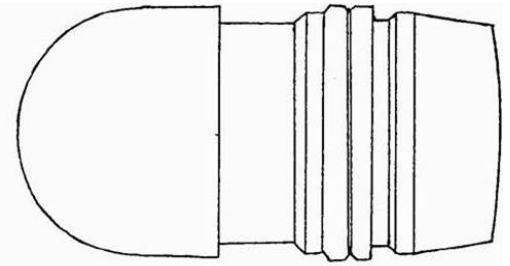
M385A1 TP Spark Shadowgraph

Spark Range Testing

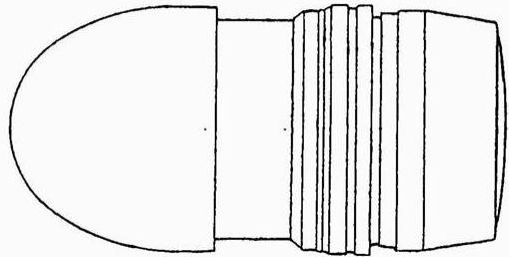
- Previous 40mm spark range testing performed on high velocity cartridges
  - "BRL-MR-3788 Aero Characteristics of 40mm Ammo for the Mk19 GMG", Robert McCoy & Andre Sowa, November 1989
  - M384 & M385 no longer in service
  - M430 now M430A1 and M385E4 now M385A1



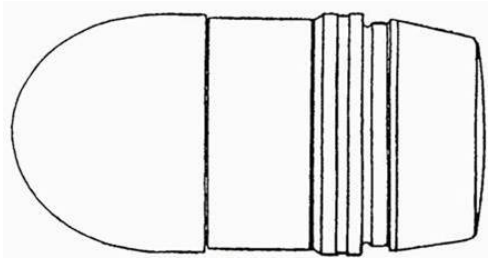
M430 HEDP



M385E4 TP



M385 TP



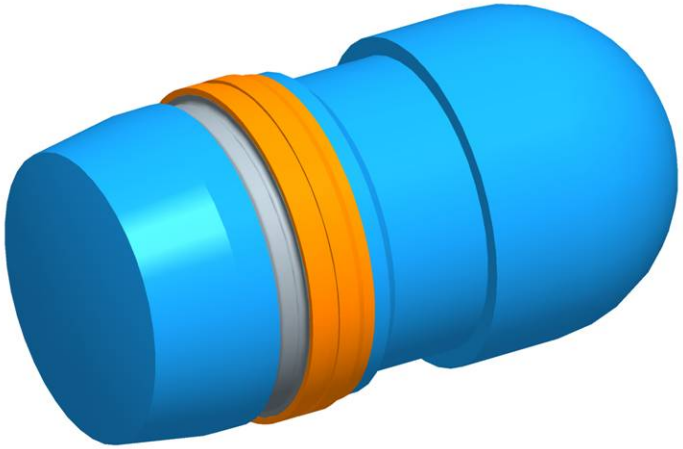
M384 HE

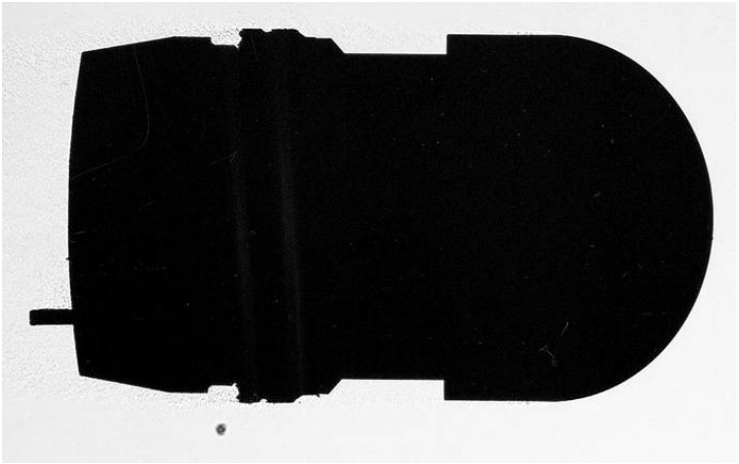
Spark Range Testing

- Perform Spark Range Testing at ARL and Eglin AFB on both Low & High Velocity projectiles
  - M433 HEDP (M203 GL) - Complete
  - M781 TP (M203 GL) - Complete
  - M430A1 HEDP (Mk19 GMG) – Firing Now
  - M918 TP (Mk19 GMG) – To Be Fired
  - M385A1 TP (Mk19 GMG) - Complete
- Low Velocity testing with both 12” & 9” M203 GL barrels

Spark Range Testing

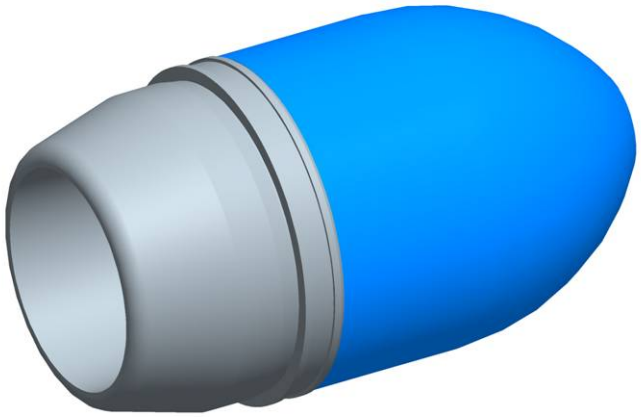
- M385A1 TP (High Velocity)
  - Large gyroscopic stability factor (>4 vs. >1.8)
  - Weak pitch damping coefficient





Spark Range Testing

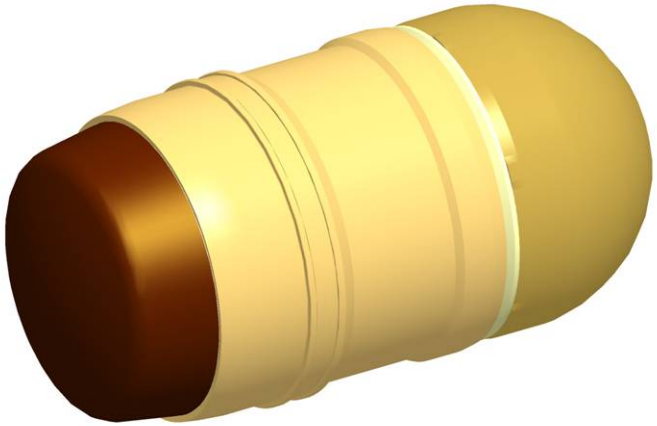
- M781 TP (Low Velocity)
  - Large gyroscopic stability factor (>6 vs. >1.8)
  - Weak pitch damping coefficient
  - Small Transverse Moment of Inertia





Spark Range Testing

- M433 HEDP (Low Velocity)
  - Weak pitch damping coefficient
  - Very high pitch/yaw angle at muzzle exit resulting in high drag (up to 14 degrees!)
  - Adhesive on boattail affects flight in random manner

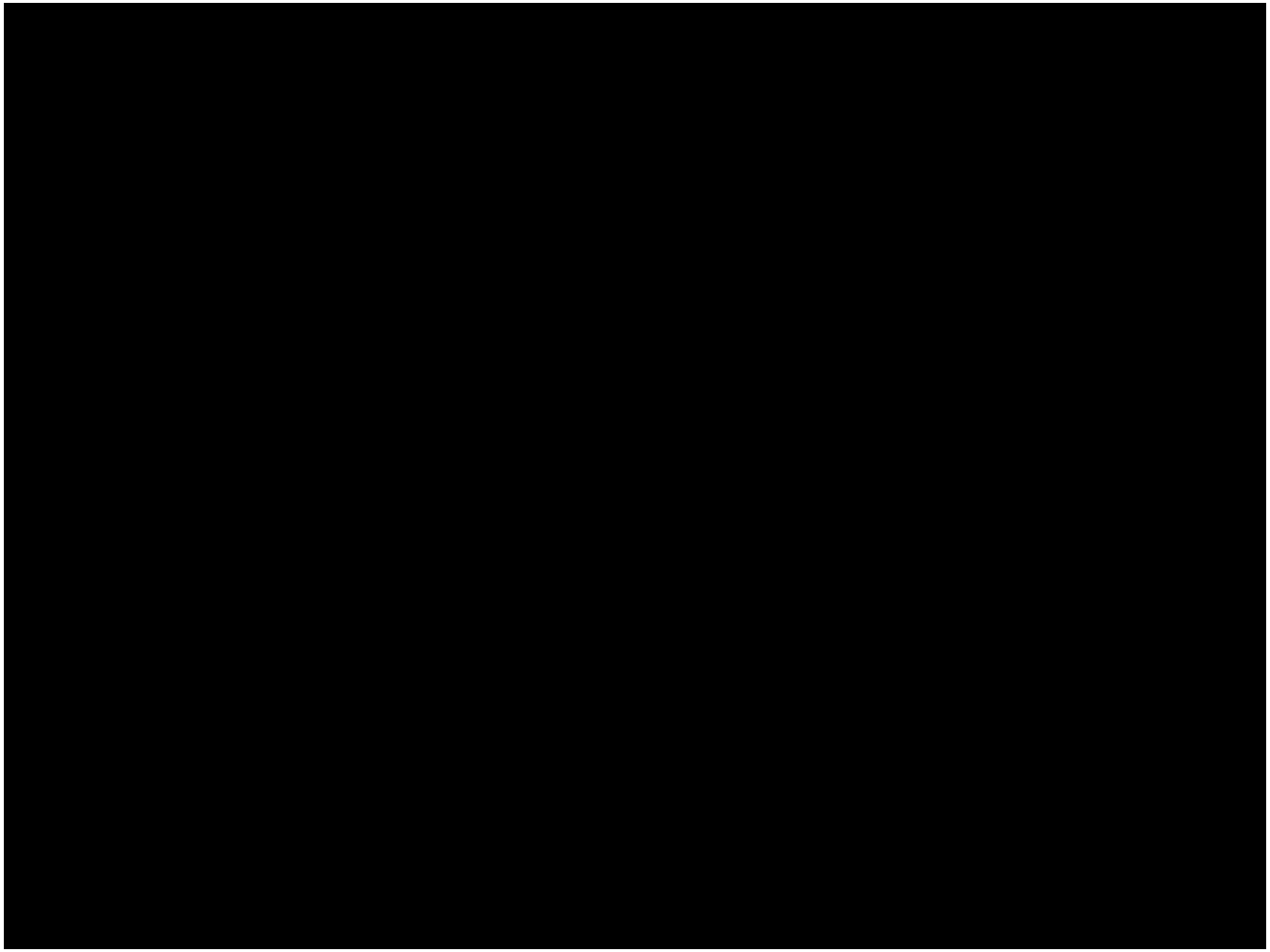




Spark Range Testing



Spark Range Testing



Spark Range Testing

- Testing yielded validated PRODAS models for flight simulation
- Projectiles will not damp out initial pitch/yaw
  - Must minimize influences on projectile
  - Mitigate or eliminate adhesive on M433 HEDP boattail
  - Flexure of M203 GL and host weapon impact projectile exit (jump)

Firing Tables Testing

- Testing performed by ARDEC Firing Tables Team at Aberdeen Test Center
- Firing M433 HEDP & M781 TP cartridges from M203 GL (both 12" & 9" barrels) & XM320 GL.
- Testing performed:
  - Physical Characteristics of Ammunition - Completed
  - Muzzle Velocity vs. Propellant Temp Test - Completed
  - Ballistic Match & Firing Tables Test - Completed
  - Maximum Range Aeroballistic Test - Completed
  - Maximum Trail Quadrant Elevation Test - Completed

Firing Tables Testing

- **Ballistic Match, Firing Tables & Max Range Tests**
  - **Firing Tables & Unit Effects Tables available for both M433 HEDP & M781 TP in the 12” & 9” M203 GL and XM320 GL**
  - **M781 TP considered ballistically matched to the M433 HEDP out to 300 meters**

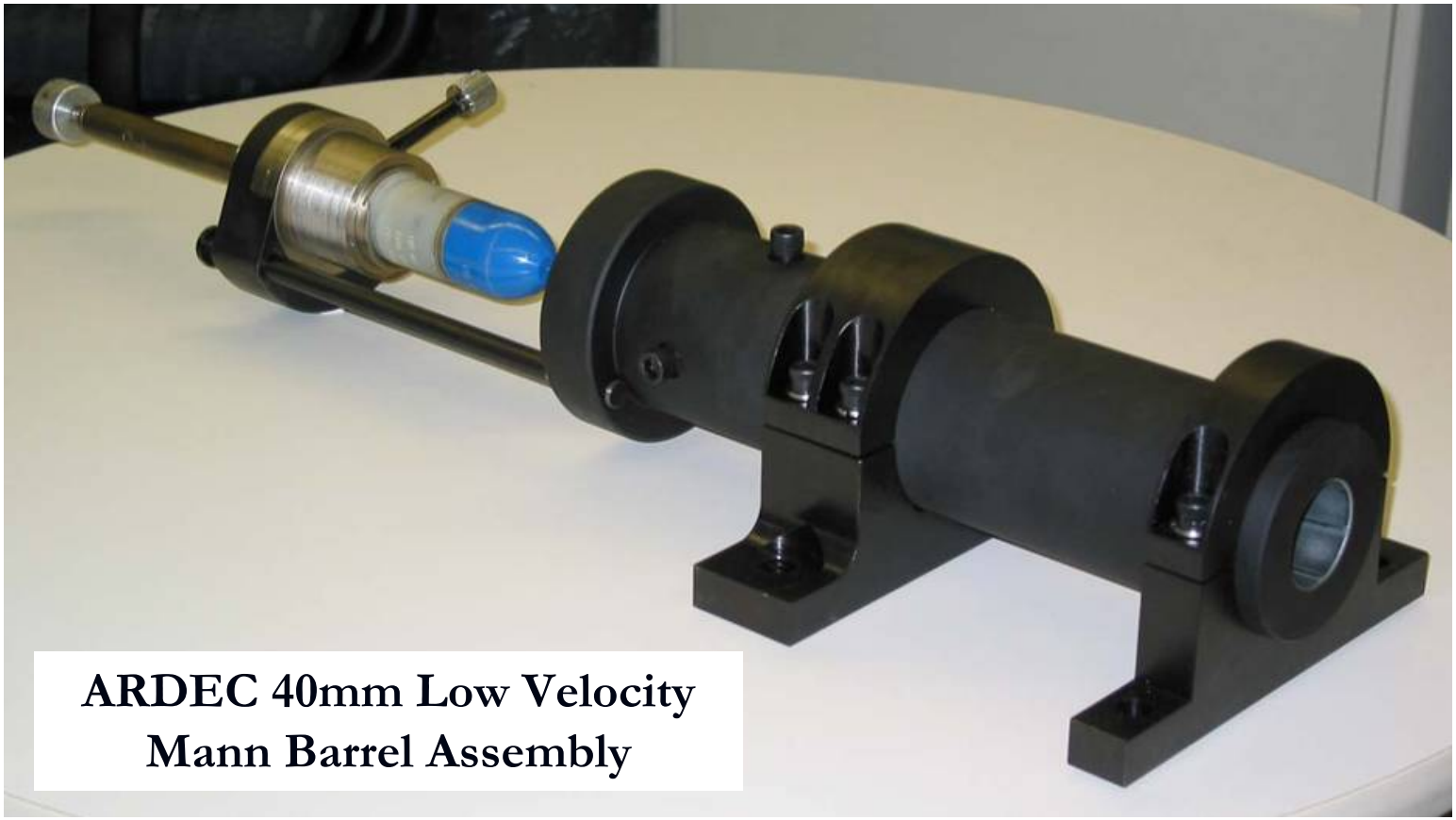
Firing Tables Testing

- Shorter barrel lengths do reduce muzzle velocity, but temperature change have minor effect
- Currently planning for High Velocity Firing Tables Test with M430A1 HEDP & M918 TP
  - Ballistic Match & Firing Tables
  - Maximum Range
  - Sight Accuracy

EPVAT with Soft Recovery

- EPVAT - Electronic Pressure, Velocity & Action Time is scarce for 40mm Grenade Ammo
  - High Velocity P-t data from Mk19 during development
  - HV action time taken from M129 GMG during LAT
  - No Low Velocity data on record
  - No established method for EPVAT testing during production or development
- Fired Low Velocity EPVAT from Mann barrel & soft recovered projectiles
  - Mann barrel designed by ARDEC & fabricated by Colt
  - Test ammo fabricated from production hardware

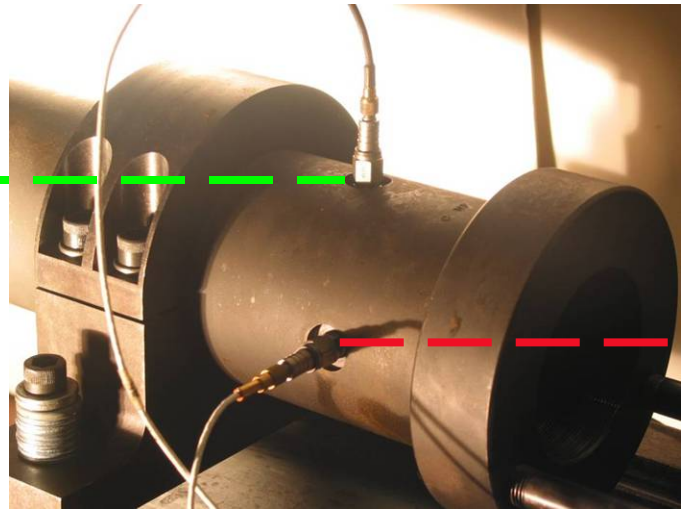
EPVAT with Soft Recovery



ARDEC 40mm Low Velocity Mann Barrel Assembly

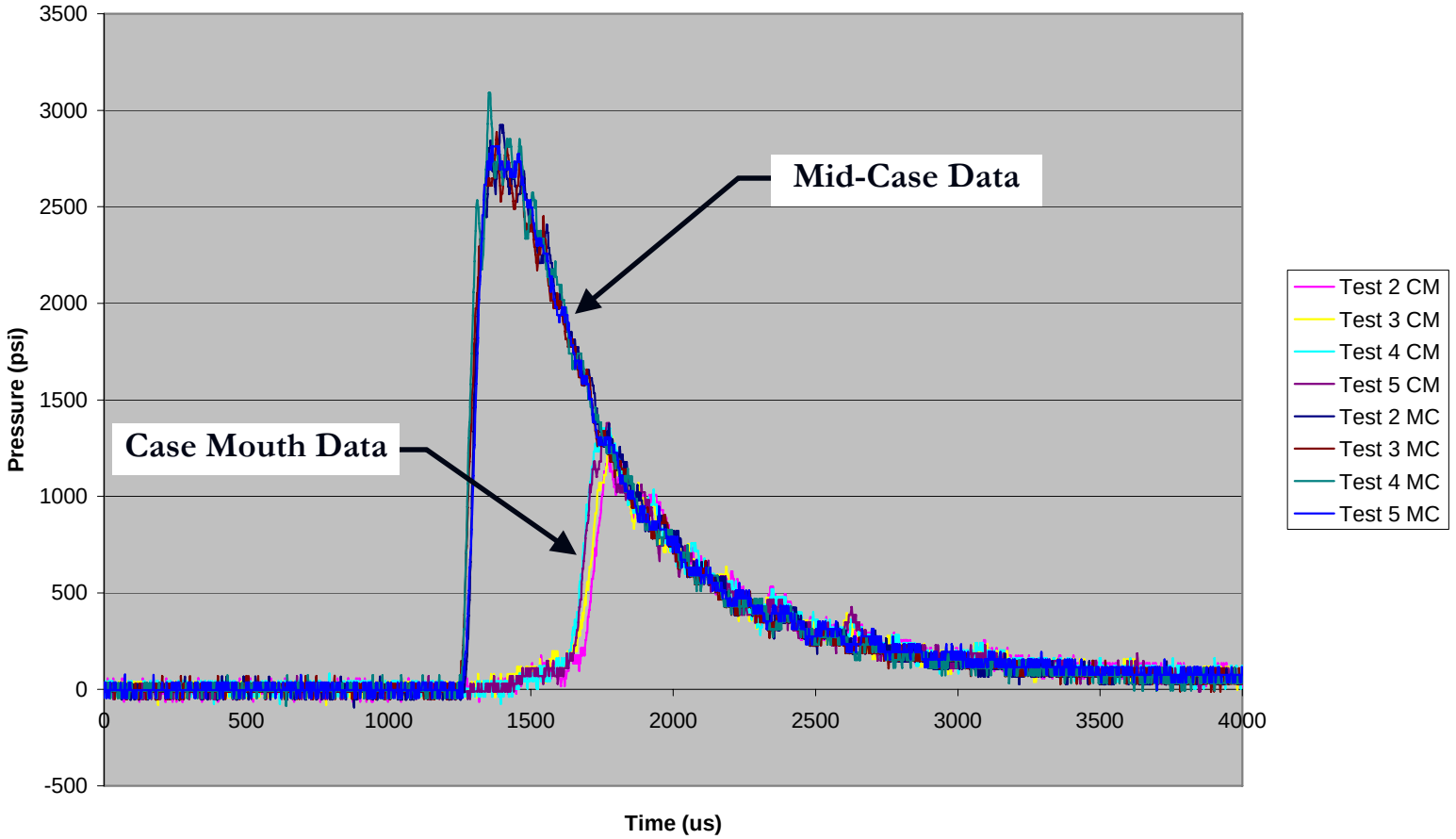
EPVAT with Soft Recovery

Low Velocity Pressure Port & Cartridge Case Diagram



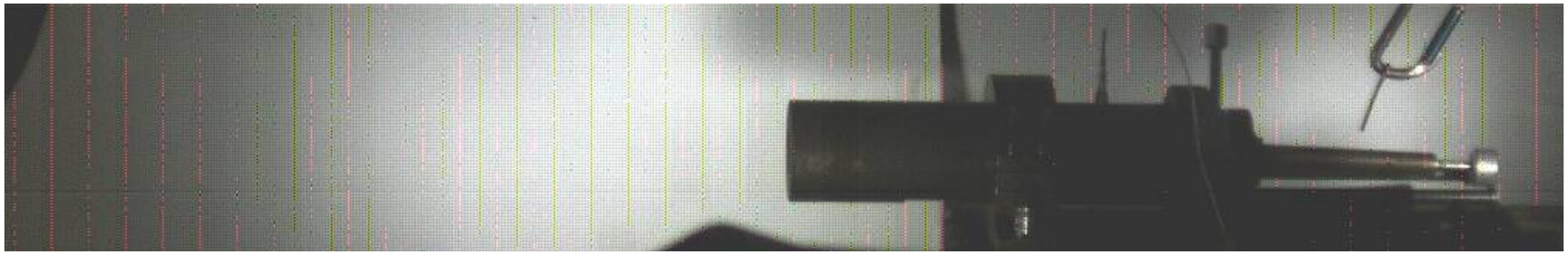
EPVAT with Soft Recovery

M433 Case Mouth & Mid-Case Ports at 70°F
Pressure VS Time



EPVAT with Soft Recovery

- Used high speed digital video to capture action time & muzzle velocity
- Action time is from plunger stop to complete projectile exit



Mann Barrel Firing of 40mm M433 HEDP Projectile

EPVAT with Soft Recovery

- Poor engraving on all cartridges
- Residual adhesive on M433 HEDP & M781 TP



M433 HEDP



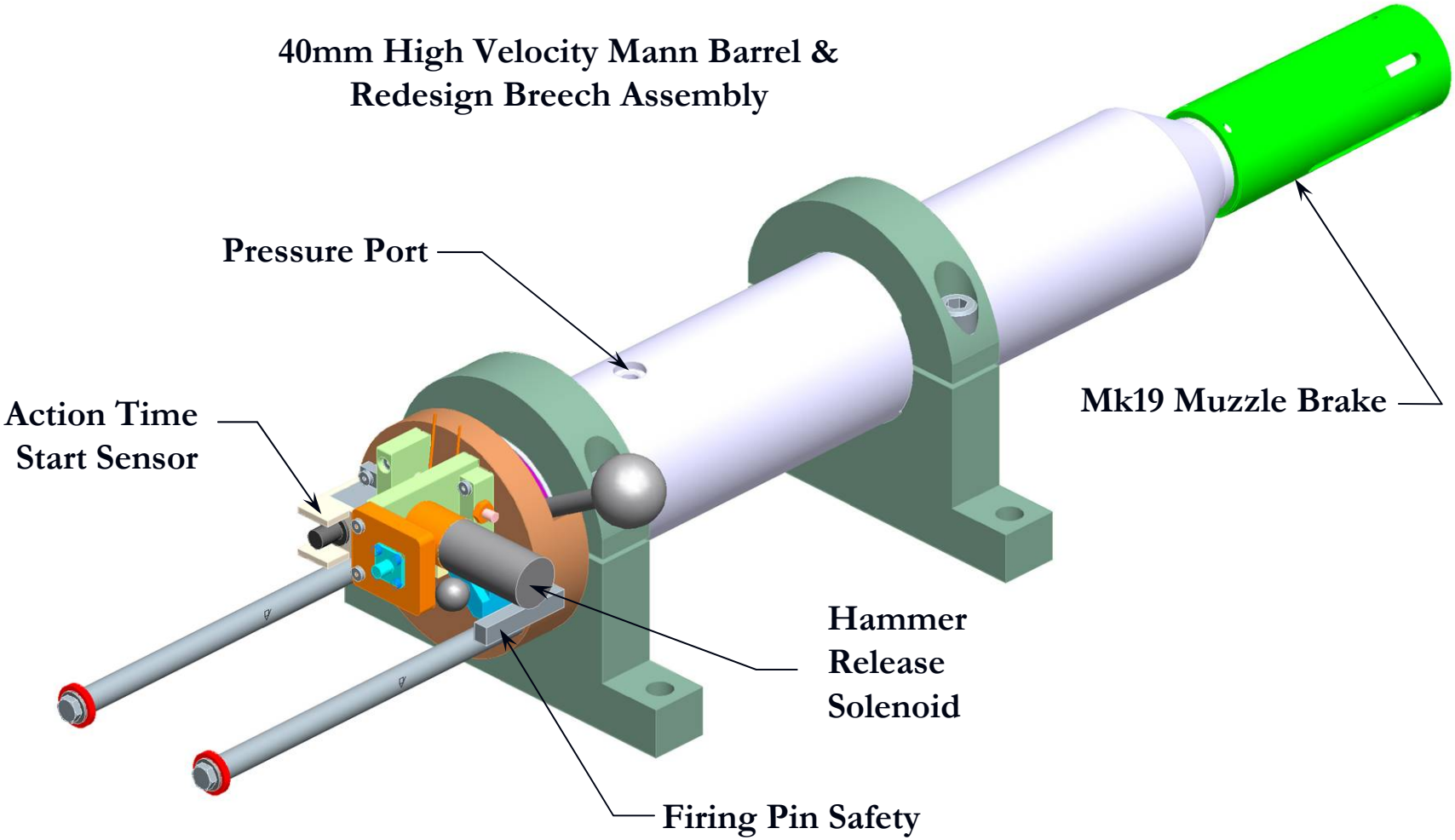
EPVAT with Soft Recovery

- Recorded Case Mouth & Mid-Case P-t data at hot, cold & ambient temperatures for all cartridges
  - M433 HEDP, M583A1 Whitestar Parachute & M781 TP
  - Measured Case Mouth & Mid-Case simultaneously on M433 HEDP at Hot, Cold & Ambient with no noticeable difference versus single port measurement
  - Residual adhesive on boat tail is irregular shaped
    - Bad for Flight
  - Poor rotating band engraving yields blow-by
    - Bad Efficiency + Muzzle Exit Influence

EPVAT with Soft Recovery

- High Velocity EPVAT planned for July/Aug 2007
- Currently fabricating High Velocity Mann Barrels & redesigned Breech Assembly
  - Breech to be used on both HV & LV Mann Barrels
  - Plan to fabricate Low Velocity Mann Barrels that accept redesigned breech

EPVAT with Soft Recovery



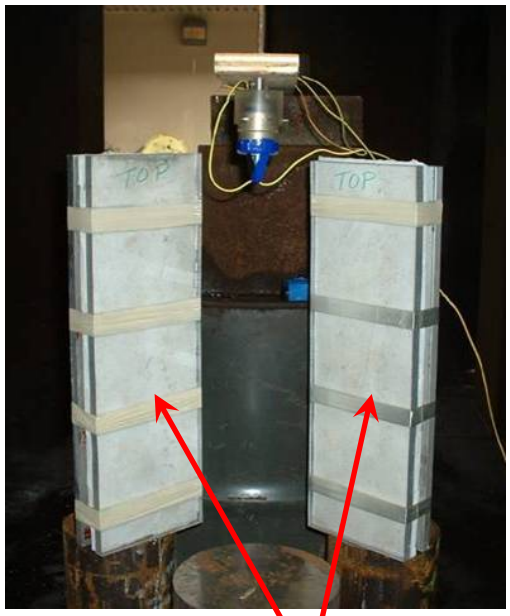
Warhead Testing

- Testing performed by ARDEC Warhead Branch
- Characterize fragmentation & shaped charge penetration performance
  - M433 HEDP – Completed
  - M430A1 HEDP – Completed
- Typical LAT's test for penetration, but do not test for fragmentation performance
- Results run through CASRED for Probability of Incapacitation
  - Compared to historical data on file

Warhead Testing

- **Penetration Performance Characterization**

No-Spin Fixture



Orthogonal X-Ray Film Packs

Penetrated RHA

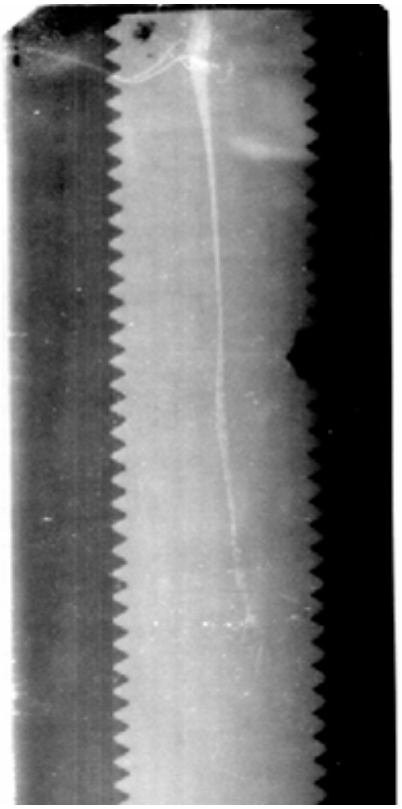


Spin Fixture



Fiber Optic Spin Rate Pickup

X-Ray of Jet Formation



Warhead Testing

- Fragmentation Performance Characterization



Detonation Chamber



Projectile in Balloon in Saw Dust



Separation Apparatus

Vacuum

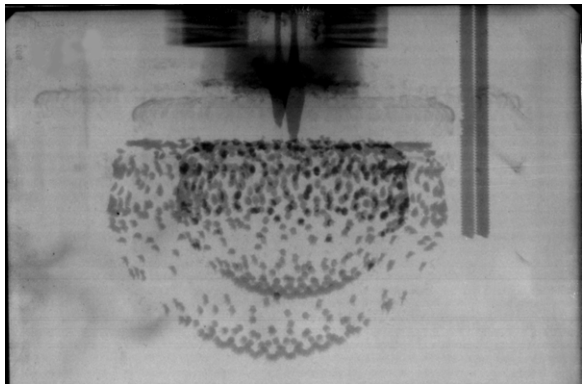


Ferrous

Non-Ferrous

Warhead Testing

- Fragmentation Performance Characterization

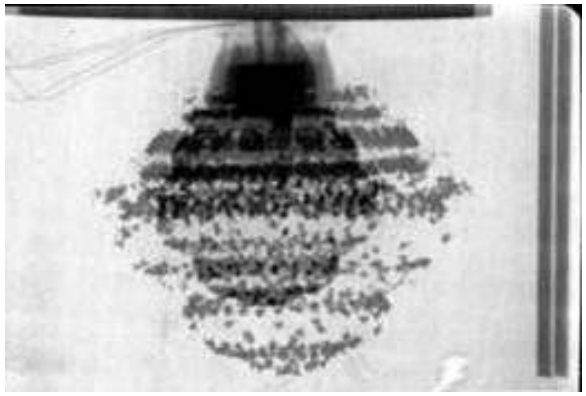


X-Ray of Fragmentation

M433 HEDP



Fragment Recovery



M430A1 HEDP



Warhead Testing

- Testing showed no change in lethality from historical data
- Improvement in penetration is easily achievable
- Exhibited good fragmentation break-up
- Fragmentation effects can be improved
- Modeled & simulated shaped charge & fragmentation performance
  - Validated by testing

System Effectiveness M&S

- Model the collection of system parameters & errors in order to run them through a Monte Carlo type simulation
  - Output is Probability of Hit & Probability of Incapacitation given a Hit
  - Study applied to M433 HEDP & M430A1 HEDP
- Intent is to determine improvements with highest return on investment

Benefits & Warfighter Payoff

- Benefits
  - Robust ballistic & warhead performance database
  - Manage risk by proactively resolving problems
  - Solid basis for determining improvements with highest return on investment
- Warfighter Payoff
  - Ensuring a superior product that is reliable & safe
  - Improved ballistic & lethal performance

40mm XM1112 Airburst Non-Lethal Munition (ANLM)
10 May 2007

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Sponsors: JNLWD

User Support: USAIC
USAF

Approved For Public Release

Participating Organizations

- **JNLWD**
  - Sponsor
- **USAIC/DCD – Firepower Division**
  - Requirements Generation and User Proponent
- **Air Force Security Forces Center (AFSFC)**
  - User Proponent
- **PM-SW**
  - RDT&E Execution
- **PM-CCS**
  - Production Execution
- **ARDEC**
  - Munition Lead and Fuze Design
- **Dahlgren**
  - Payload Technical Lead
- **ATK Launch Systems**
  - Payload Design and Integration Support
- **HECOE**
  - Human Effects Analysis and Support
- **SAVIT Corp.**
  - Cartridge Design, Integration, and Development Hardware Support
- **Aberdeen Test Center/Navy Warfare Center CRANE**
  - T&E
- **Indiana Ordnance Inc.**
  - Developmental Testing
- **Kansas State University**
  - Environmental Assessment

Approved For Public Release

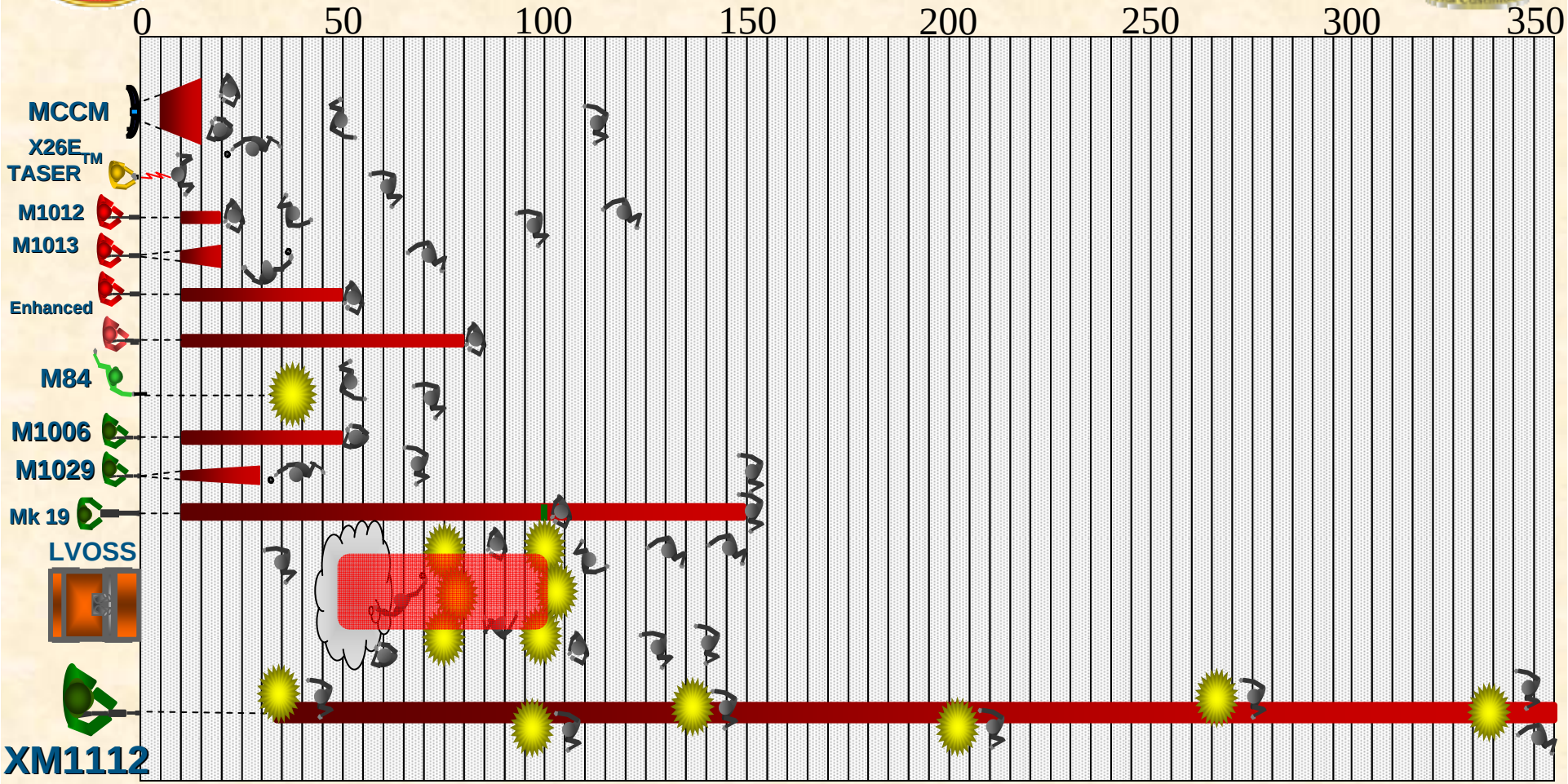
Design Goals

Parameter	Threshold	Objective
Duration of Non-lethal Effect	≥ 30 seconds	≥ 60 seconds
Ballistics	Close to M433 HEDP	Matches M433 HEDP
Reliability	95%	98%
Minimum Engagement Range	35 meters	15 meters

- CDD through TRADOC in staffing for AROC approval

Approved For Public Release

The Need



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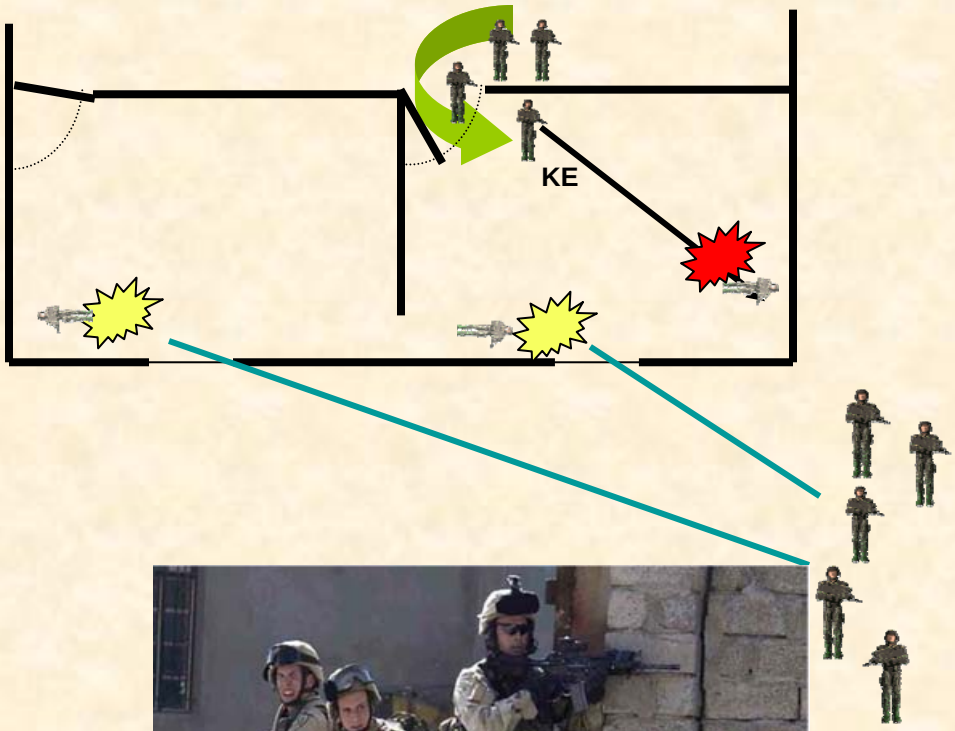
Concept of Operations (CONOPS) – Crowd Control

Improved non-lethal capabilities will provide advantages in self-protection, crowd control engagement where combatants and non combatants are intermixed, and they will aid in determining hostile intent.



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CONOPS – Room Clearing





- Engage and control local residents to preclude their involvement and their injuries
- Dislodge terrorists from their HQ without causing extensive collateral damage
- Dislodge enemy from strongholds without causing extensive damage or non-combatant casualties

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CONOPS – Warning Munition

Shipboard and Convoy Protection

- Create and enforce standoff area around vessels and convoys.

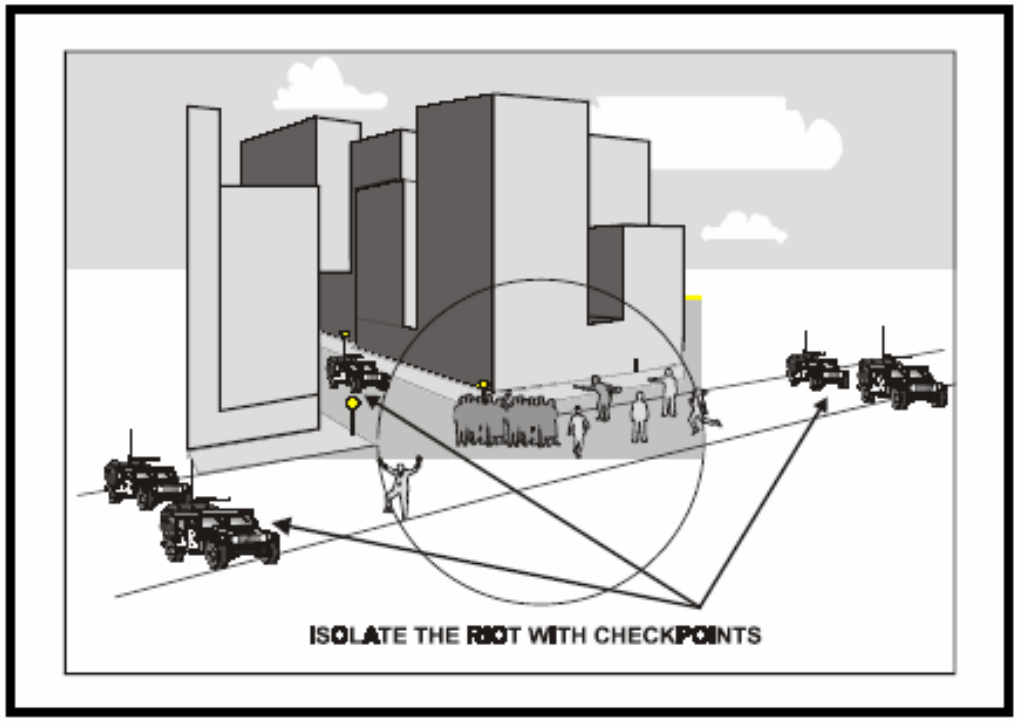






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CONOPS – Checkpoints



Isolate, dominate, maintain common situational awareness, and employ multi-dimensional/multi-echeloned actions. Employing lethal and non-lethal means to control the situation while reducing casualties and collateral damage.

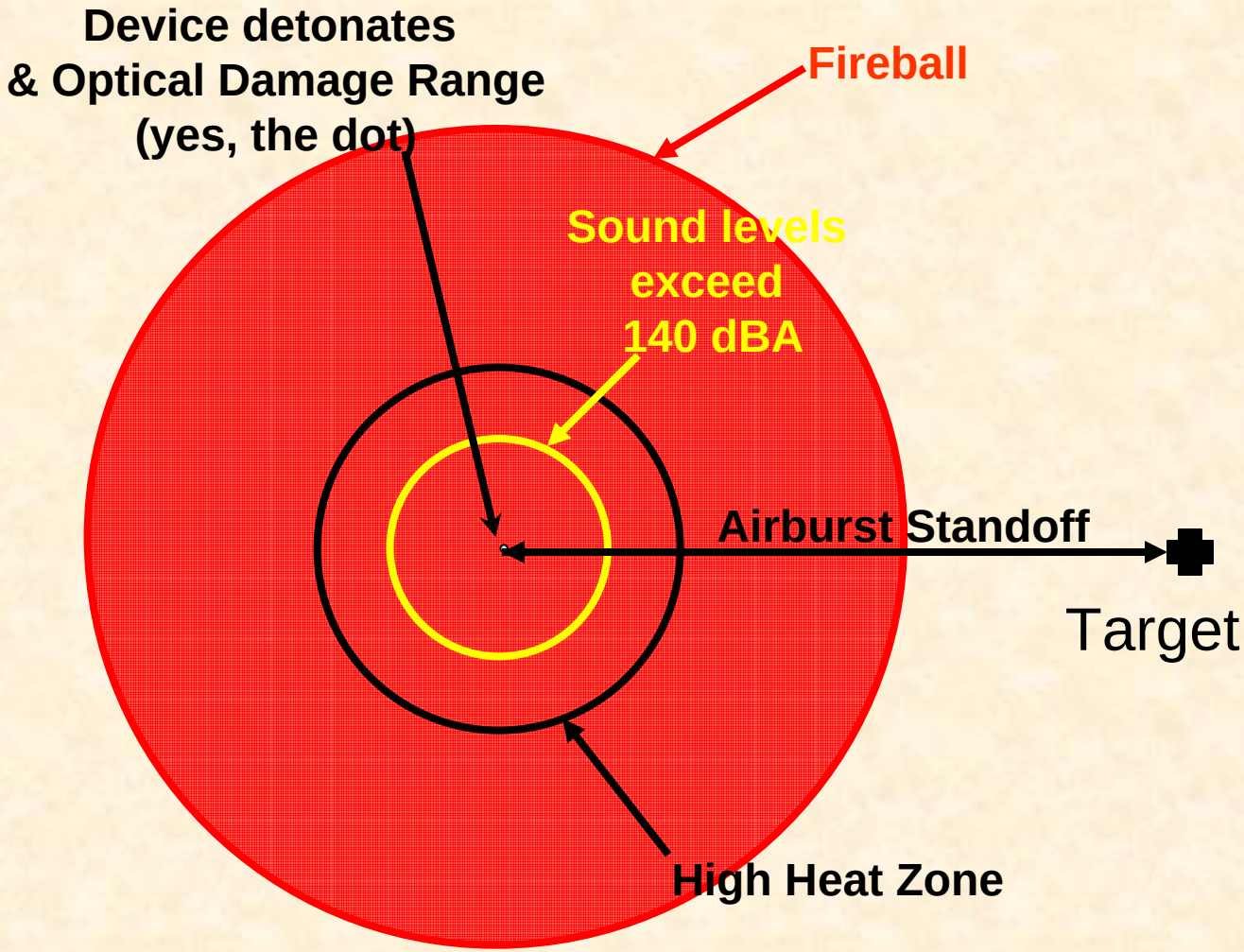
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What It Does

- Weapon
  - M203 Grenade Launcher
- Effective Range
  - Same as standard M203 ammunition
- Initiates in front of target or delay can be set by user for room clearing operations
- Cartridge stops in mid air dispensing payload
- Multiple Non-Lethal Effects:
  - Temporary Scotoma – up to 1 minute
  - Temporary Hearing Shift – duration and magnitude vary by distance
  - Heating

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Human Effects



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Demonstration Video



- June 29, 2006 Demo
  - Target - 12’ x 8’ plywood @ 100m
  - Direct Fire at Night

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Industry Opportunities

- Fuze Development/Production Contract
  - Team with ARDEC engineers in transferring existing fuze design into production
  - Demonstrate producibility through building test fuzes using actual mass production equipment and processes
  - Options
    - Produce final integrated cartridge assembly for qualification.
    - Follow – on production
  - Planned RFP 1Qtr FY08

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QUESTIONS?



Approved For Public Release

GENERAL DYNAMICS
Armament and Technical Products

XM307 ACSW Dual Feeder and Receiver Design for Rough Handling

Presented by:

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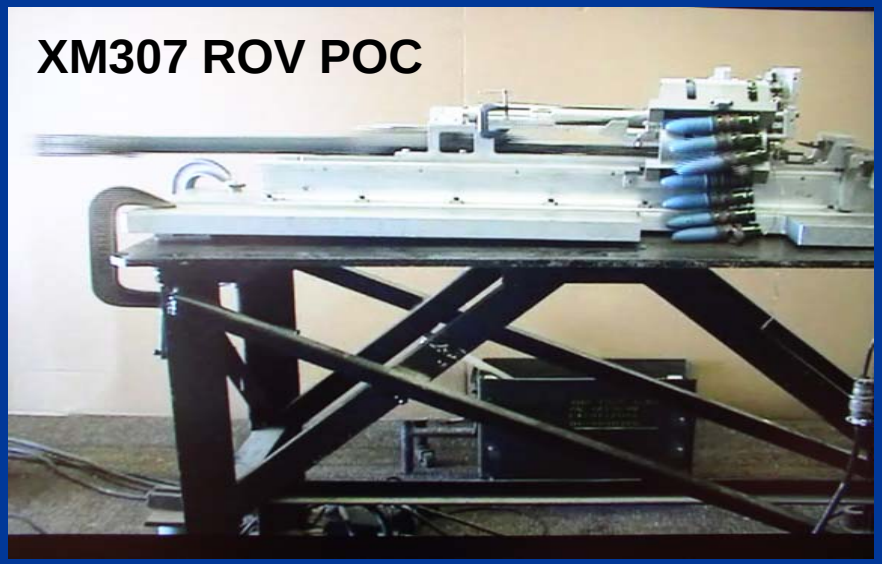
DISTRIBUTION A - Unlimited

Agenda

- XM307 ACSW Dual Feeder
- Receiver Design for Rough Handling

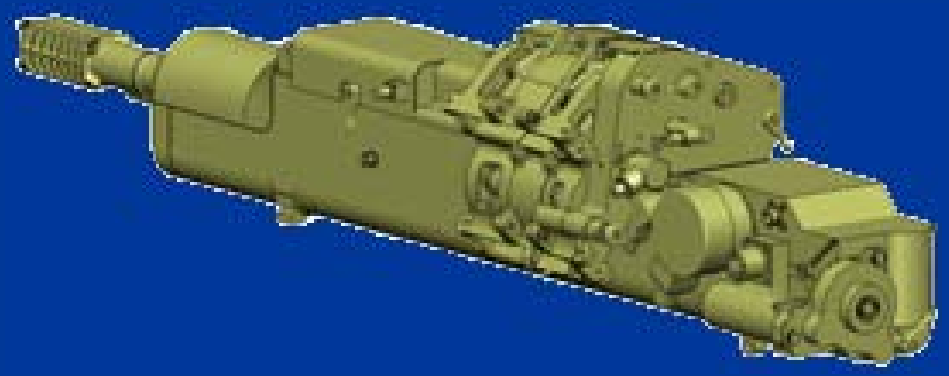
XM307 ACSW Dual Feeder

- Overview
- Key Requirements
- Design Approach
- Ammunition Select Sequence
- Analytical Model and Test Correlation
- Summary



XM307 Remotely Operated Variant (ROV)

- Light weight remotely operated dual feed weapon
- Provides armament for modern, light weight manned and unmanned vehicles
- First round selectable under 2 seconds
- Enable engagement with Armor Piercing (AP) or High Explosive Air Bursting (HEAB) 25 mm Ammunition



XM307 ROV

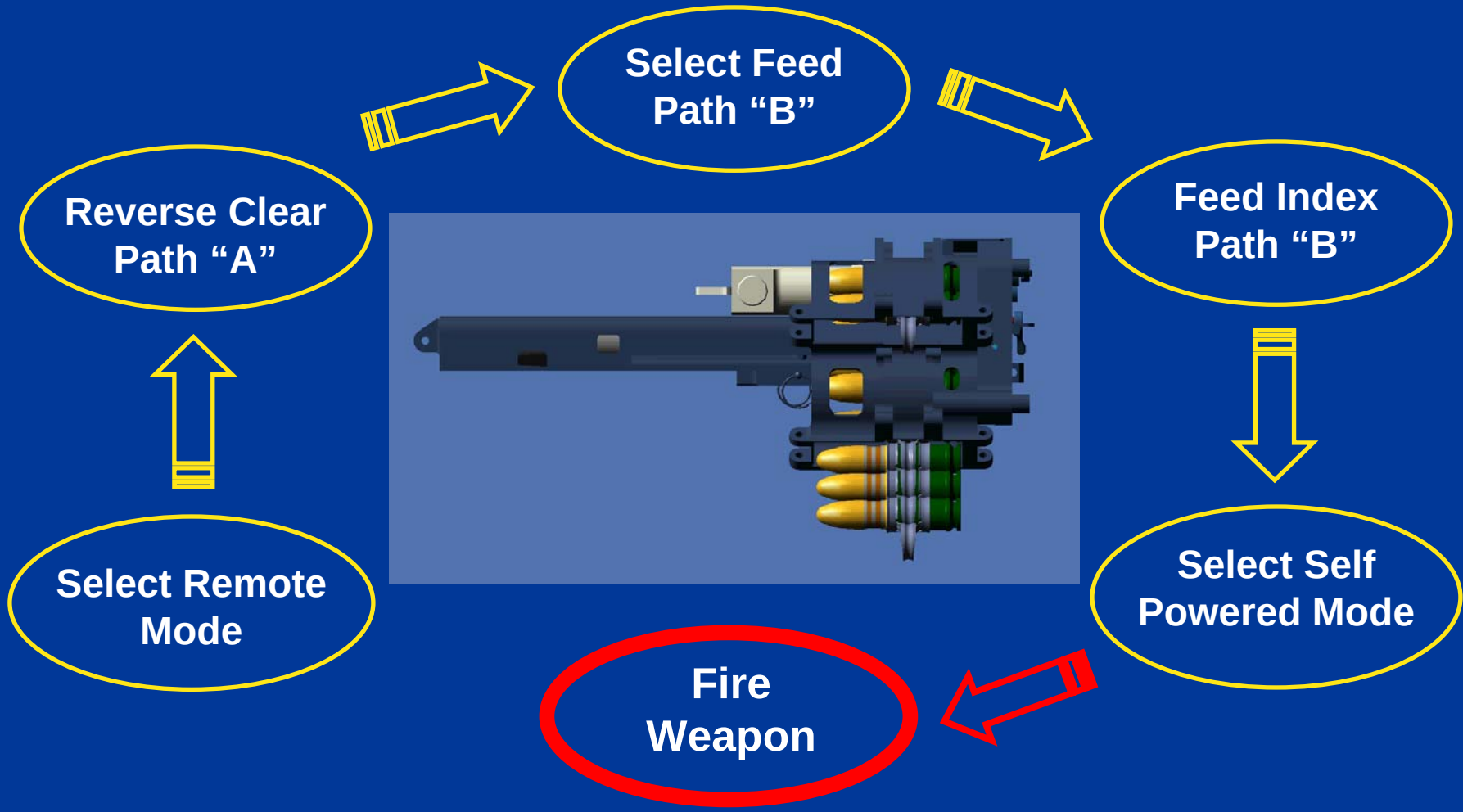
Key Requirements

- HEAB capability with either feed path
- Remotely change feed paths with first round response
- Weapon self powered operation

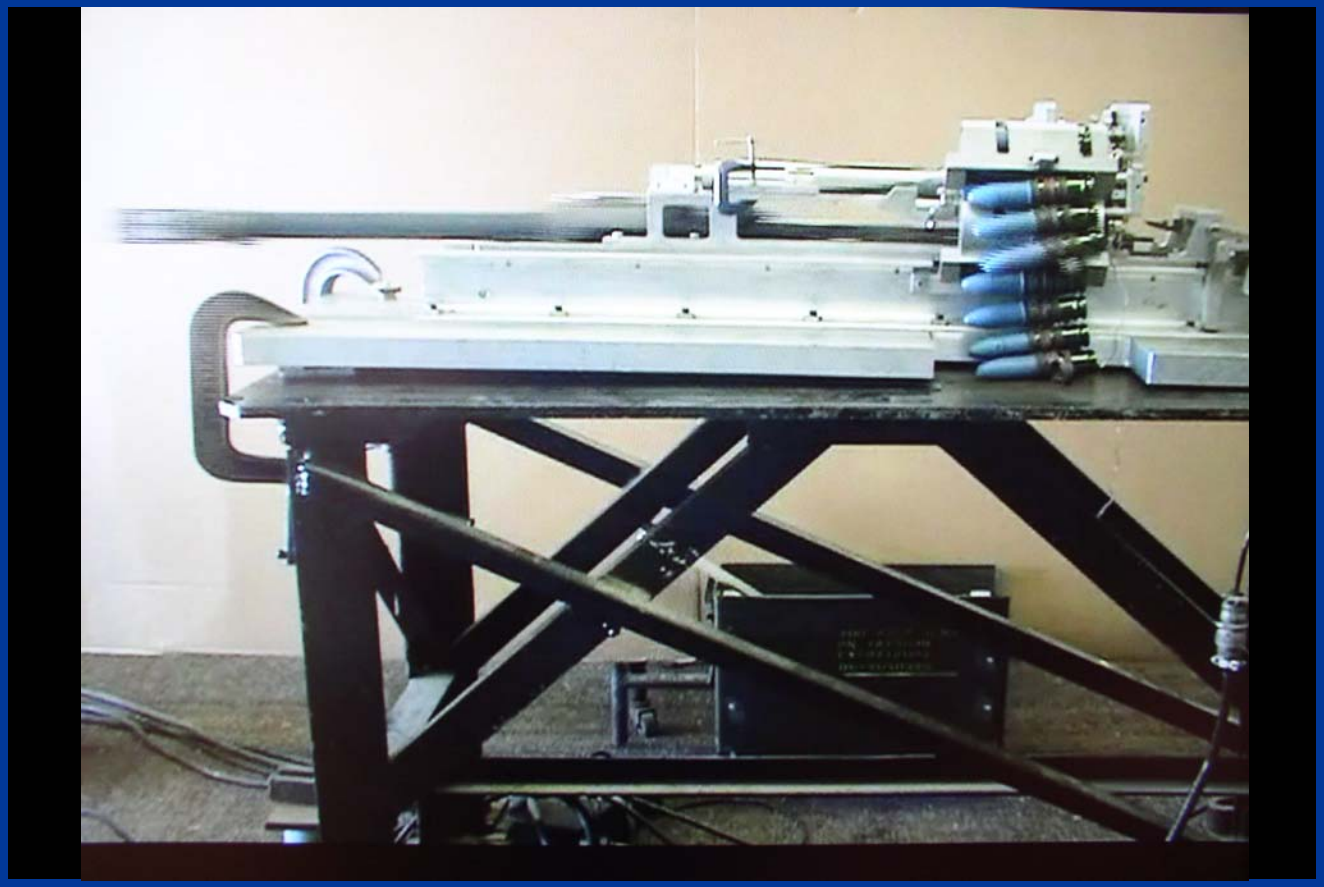
Design Approach

- Develop integrated dual feed weapon
- Validate design with concept hardware
- Create analytical models
- Evaluate design and correlate analysis predictions to concept test results

Ammunition Select Sequence



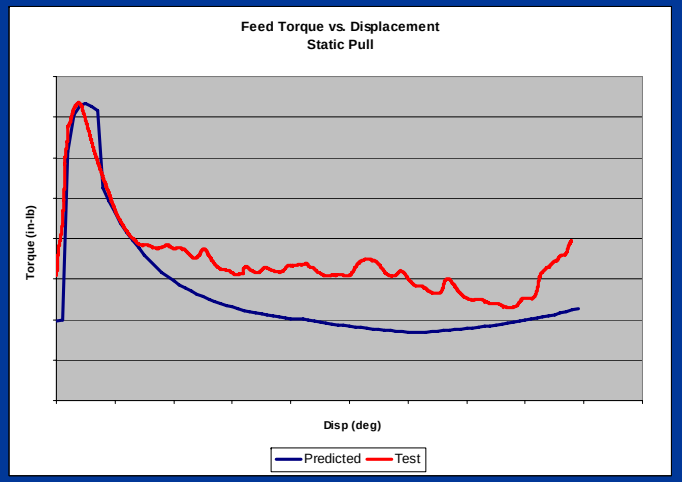
Live Fire Concept System Test

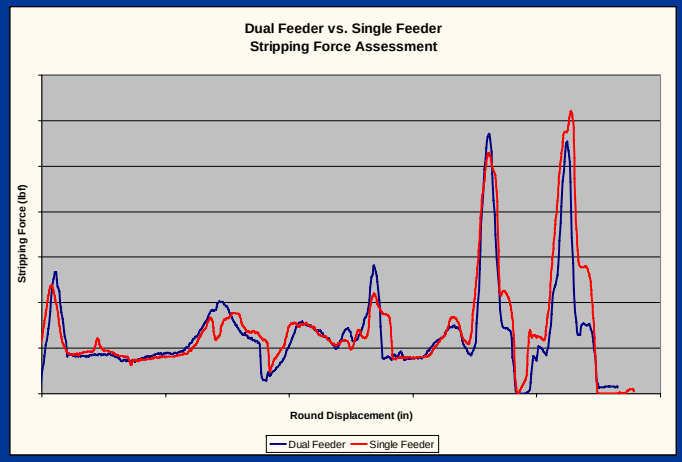


- Successfully test fired TP ammo from both feed paths

Analytical Model and Concept Test Correlation

- Functionality validated on Proof of Concept feeder assembly
  - Static and dynamic feed and clear
  - Round stripping and chambering
  - Belt select mechanism
  - Power select mechanism
- Concept test results correlated to analysis model predictions
- Verified analytical tools and test hardware reduced risk for objective dual feeder design





Summary

- Successfully completed preliminary design phase
- Dual feeder concept hardware functioned per design intent
- Analytical models correlated to concept test results
- GDATP's proven design methodology provides a solid foundation for future weapon development

Receiver Design for Rough Handling

- Requirements
- Objectives
- Analysis and Test Method
- Analytical Model and Test Correlation
- Summary



XM307 K50

Requirements

- Shall operate after 5 foot drop in 5 orientations
- No degradation to safe operation

Objectives

- Develop analytical methodology
  - Allows weapon reactions to be predicted and evaluated
  - Can be used for detail design of the weapon
- Develop Receiver configuration
  - Maintains alignment and timing of the machine gun mechanism
  - Allows the weapon to survive repeated 5 foot drops
- Validate the design approach and analytical methodology

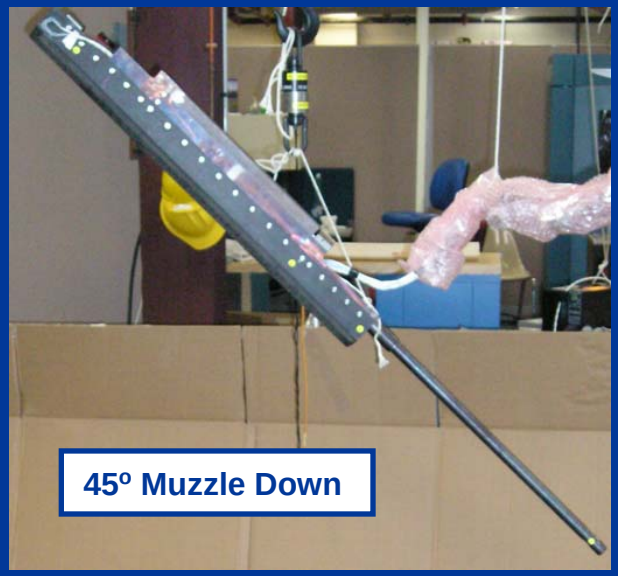
Analysis and Test Method

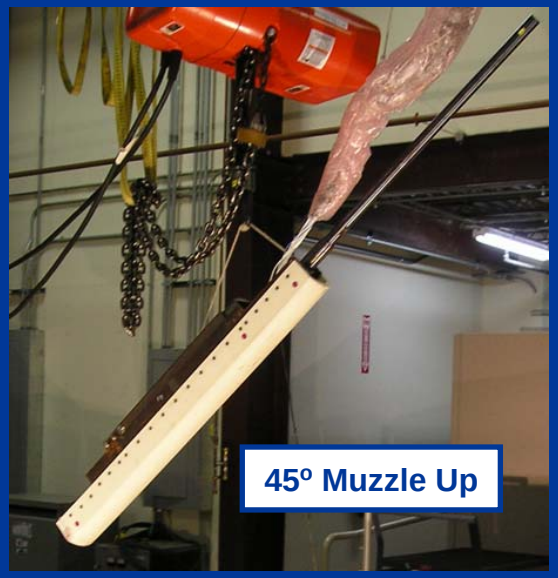
- Analysis methodology
  - Flexible body system level model created using FEA and flexible body analysis software
  - Simulated a 5 foot free-fall on a concrete-backed steel plate
  - Component CG accelerations used for detailed component design
- Drop a mockup weapon
- Evaluate alternate materials
- Data collection
  - Accelerations
  - Reaction loads between weapon components
  - Reaction strains in the receiver

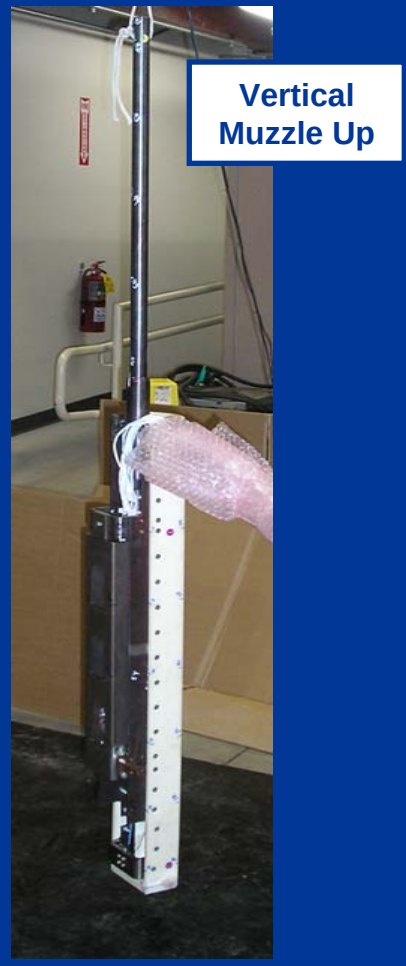


Drop Orientations









Tests Conducted

- 69 drops were completed
  - 3 Materials
  - 4 orientations
  - 8 heights

Drop Height	Material 1 Drop Orientation			Material 2 Drop Orientation			Material 3 Drop Orientation			
	Horizontal	45° Nose Down	45° Aft Down	Horizontal	45° Nose Down	45° Aft Down	Horizontal	45° Nose Down	45° Aft Down	Vertical Aft Down
6	X	XX	X							
12	X	X	X	X	X	X	X	X	X	
24	X	X	XX	X	X	X	X	X	X	
30										X
36	XX	X	X	X	XX	X	X	X	X	
48	X	X	X	X	X	X	X	X	XX	
60	X	X	X	XX	XX	XX	XXXXXX	XXX	XXXX	X
78							X			

Drop Test Video

- Weapon mockup reaction to rough handling drop test
- 5ft height, 45º Aft Down Drop Orientation



Test Results
Material Summary




Material 1




Material 2




Material 3

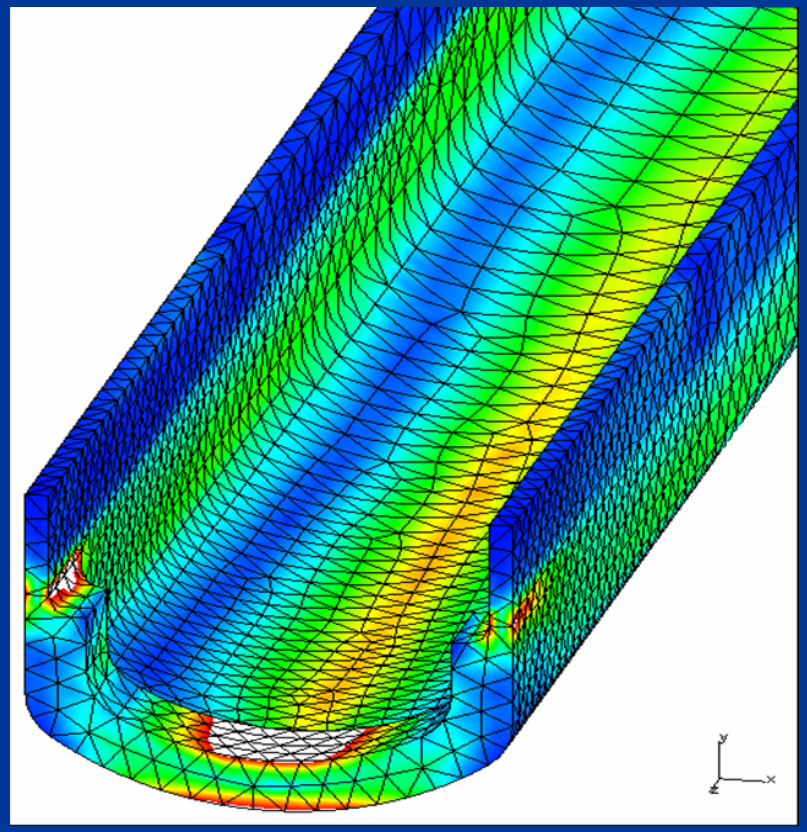
- Material 1 shell cracked after 9th drop
- Material 2 shell cracked after 19th drop
- Material 3 shell did not crack after 29 drops

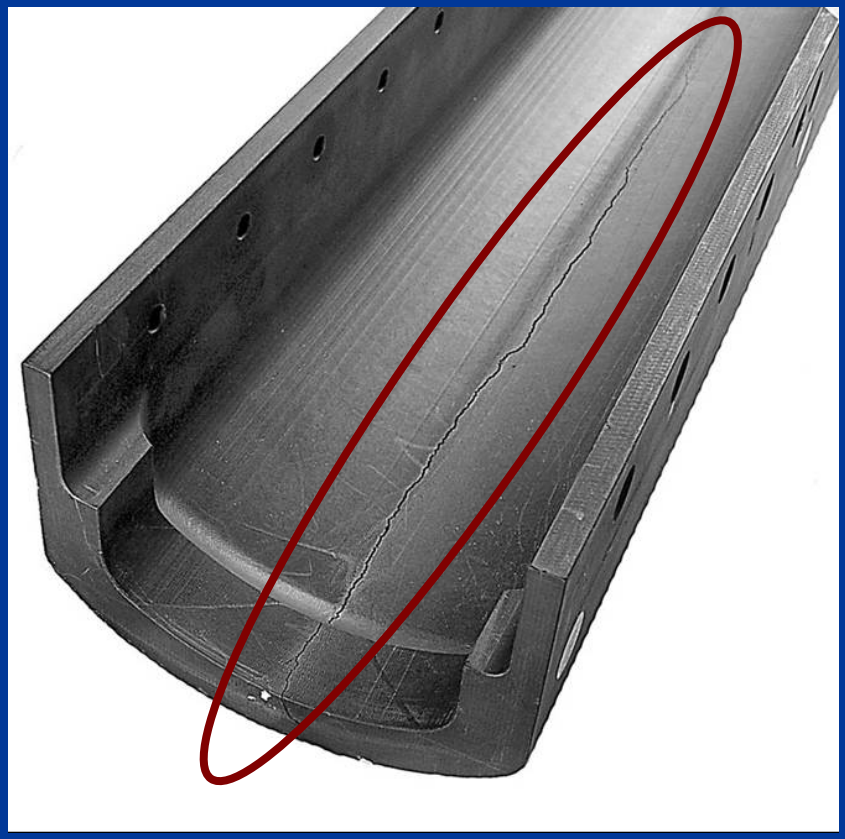
Analysis vs. Test Results
CG Accelerations

- Analytical CG accelerations correlated with test results

Drop Orientation	CG Acceleration, G's	
	Test	Analysis
Horizontal	497	489
45^{o} Muzzle Up	309	344
Vertical Muzzle Up	614	626

Analysis vs. Test Results
Strain





- Analysis method predicts failure at bottom center
- Receiver shell cracked at bottom center

Summary

- Receiver concept provides 5 foot drop capability
- Analytical methodology is a proven design tool
- GDATP's Methodology applied to develop lightweight objective weapons
  - Will meet severe rough handling requirements
  - Currently in fabrication

GENERAL DYNAMICS

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Miniature Day/Night Sight-Crew Served Weapons (MDNS-CSW)

8 May 2007

Presented by Mr. Michael Jones,
USSOCOM MDNS-CSW
Project Manager



Distribution Statement A - Approved for public release; distribution unlimited.







Presented to NDIA Small Arms Symposium

Distribution Statement A - Approved for public release; distribution unlimited.



MDNS-CSW Agenda

- Mission & Concept
- Purpose of The Acquisition
- Requirement Background
- Description of CSW Components

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MDNS-CSW Mission

MDNS-CSW System Mission: An Operator equipped with the MDNS-CSW system is able to recognize, engage, and defeat enemy personnel and targets during Urban Warfare and open combat to the max effective range of the host weapon. The MDNS-CSW allows Operators to transition from day to night or obscured visibility while retaining the ability to accurately acquire and target threats.

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MDNS-CSW Concept

- The MDNS-CSW System Is An Integrated System Utilizing An RS-232 (or similar non-proprietary) Bus To Enable Operator Control Of All Subsystem Functions From The RCM
- All Combat Critical Controls Will Be Controlled By RCM Mounted Switches
- Non-Critical Component Functions Controlled By GUI
- ECOS-H Optical Will Not Be Required To Meet Remote Control Requirement
- Ballistic Processor Module Will Interface With All Sighting Systems To Provide Targeting Data

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SOPMOD Client Weapons

SOPMOD ORD 5 - Core Small Arms (Threshold) ...Design For Use On:

M4A1 Carbine
M203 Grenade Launcher

ORD Annexes - Additional Weapons ....Harden For Use On, and possibly develop versions for:

SCAR
CQBR (Mark 18)
M14 and Mark 14 Enhanced Battle Rifle
AK-47/AK74 Series Assault Rifle
MK46 LMG / M249 SAW Machineguns
MK48Machineguns
M2-HB .50 Cal Machinegun (~1850 SOF units, ~150K Units US, ~6M Units W-Wide)
MK44 Minigun
M240 Series
Mk-19 40mm Machinegun
MK-47 ALGL
M72 LAAW
AT4-CS
MAAWS
MK11, MK12, MK13, & MK15 Sniper Rifles
M-24 Sniper Rifle

SOPMOD Block III MDNS-CSW Weapons of Interest

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MDNS-CSW Purpose



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MDNS-CSW Purpose



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MDNS-CSW Purpose



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MDNS-CSW Purpose



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MDNS-CSW Purpose



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MDNS-CSW Purpose



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MDNS-CSW Purpose



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Distribution Statement A - Approved for public release; distribution unlimited.

MDNS-CSW Background

- 1990's to 2005 various expedient CS aiming and signature suppression items… not system integrated
- FY 06 CSHWAL and WQM Market Surveys
- Project Initiated by Requirements W-IPT's June/July 06
- MDNS-CSW Synopsis published September 06
- Draft Performance Specification published Oct 06
- Roadmap Vetted through Requirements W-IPT Dec 06
- CSW Spec under revision for Full System Acquisition Similar to MDNS Block II

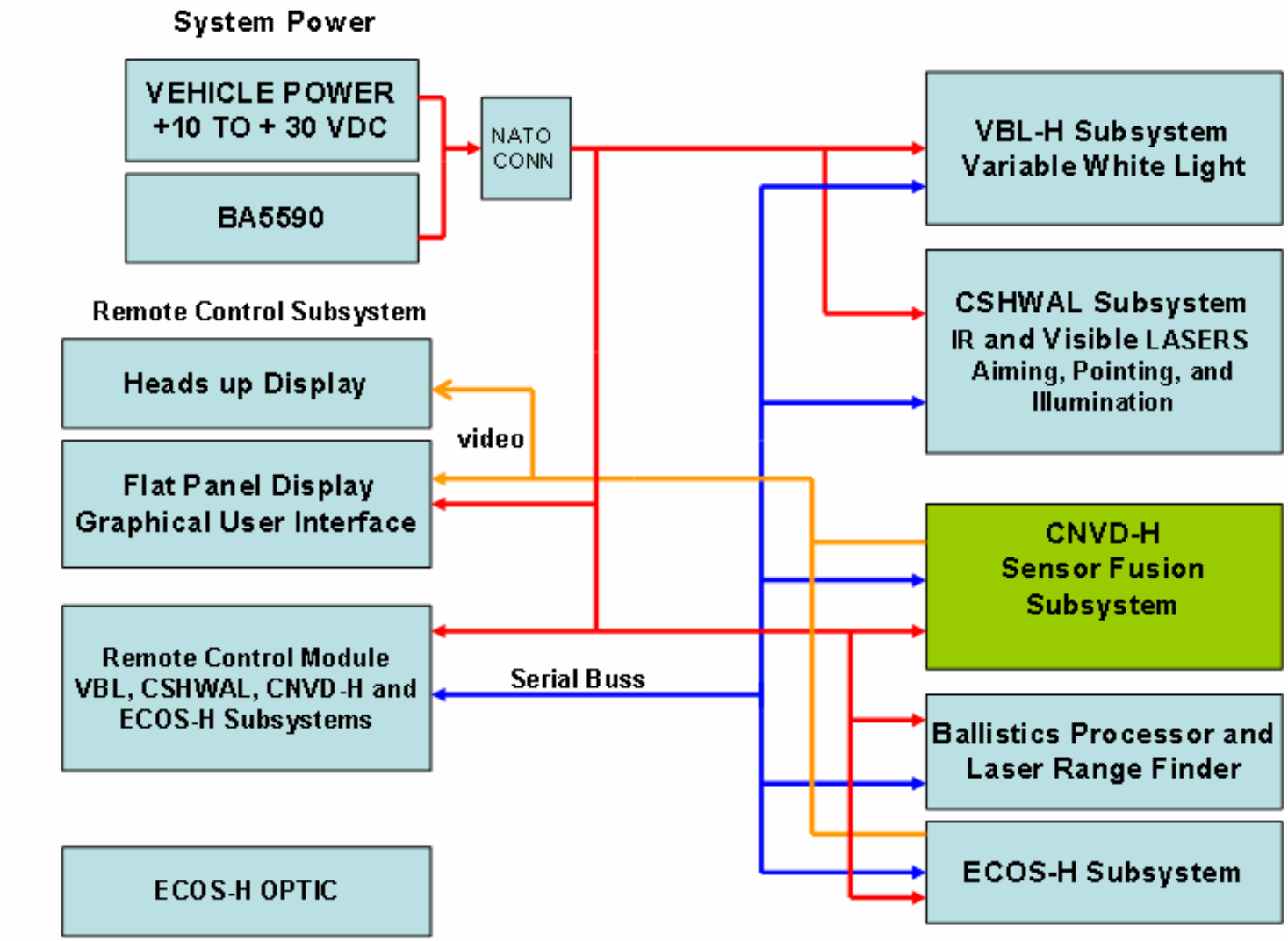
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MDNS-CSW Components

- Crew Served Heavy Weapon Aiming Laser (CSHWAL)
- Visible Bright Light - Heavy (VBL-H)
- Remote Control Subsystem (RCS)
- Rail Interface System - Heavy (RIS-H)
- Enhanced Combat Optical Sight - Heavy (ECOS-H)
- Optical “Back-Up” Sight (ECOS-H Optical)
- Clip-On Night Vision Device - Heavy (CNVD-H)
- Ballistic Processor Module (BPM)
- Improved Flash Hider (IFH)

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MDNS-CSW Block Diagram



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Crew-Served and Heavy Weapons Aiming Laser (CSHWAL)

- IR And Visible Laser
- IR Illumination
- IR Laser Divergence (0.5-10mrad)
- Visible Laser Divergence (0.5-10mrad)
- IR Illumination Beam Divergence (0.5mrad- 40°)
- Pulsed Operation Capable
- IFF (Identify Friend or Foe) Capable
- Weight Less Than 4 lbs (T), 1 lb (O)
- External Power and Onboard Back-Up
- Control Of All Functions From RCM



CONCEPT IMAGE

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Visible Bright Light-Heavy (VBL-H)

- Range of 1000 meters
- Variable Strobe (1-30 F/S)
- Variable Beam Angle (1°- 20°)
- Variable Intensity Control
- Control of All Functions From RCS
- Less than 11” L x 8” W x 8” H
- Weight Less Than 10 lbs (T), 8 lbs (O)

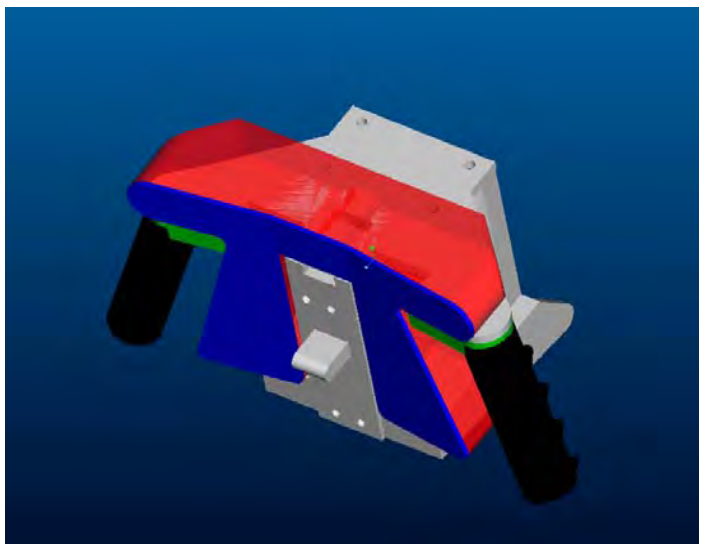


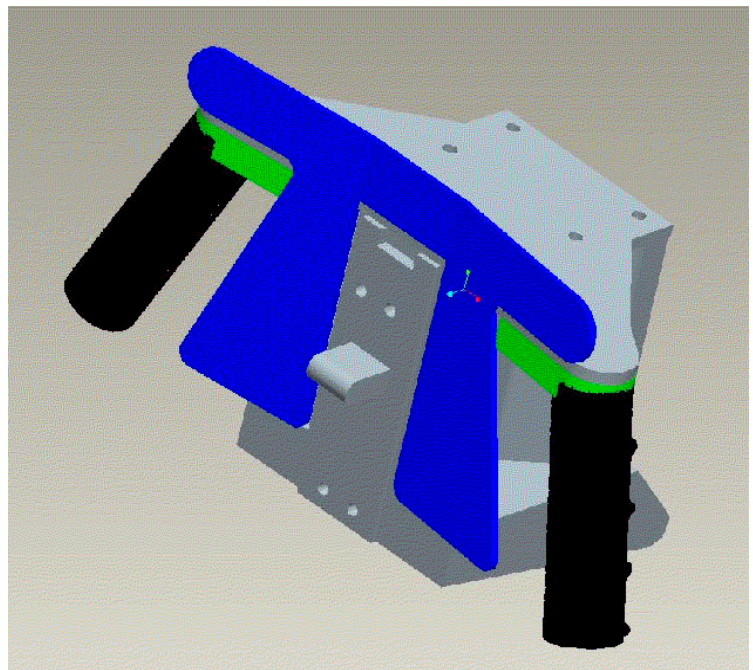
CONCEPT IMAGE

Distribution Statement A - Approved for public release; distribution unlimited.

Remote Control Subsystem (RCS)

- Controls All Functions of The MDNS-CSW System
- This Concept Drawing Shows Control Surface For Bid Sample Submittal
- Final Design Will Incorporate LCD Screen



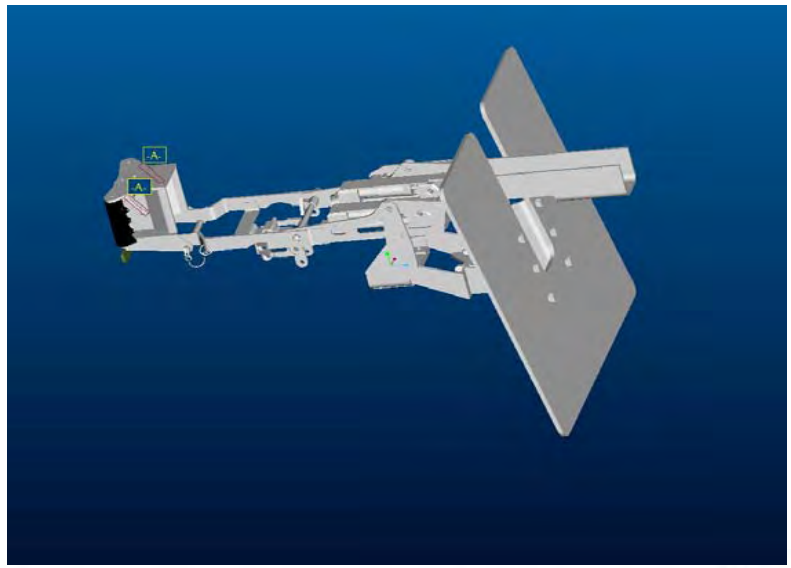


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Rail Interface System-Heavy (RIS-H)

- **Provides Mounting Surfaces Forward of The Ballistic Shield**
- **RIS-H Mounts to The MK93 Mount, Providing Decreased Felt Recoil to MDNS-CSW Components**





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ECOS-H

- Two Components
  - ECOS-H Digital
  - ECOS-H Optical
- Targets from 0- Max Effective Range
- Maintain Situational Awareness
- External Power and Onboard Back-Up
- Control Of All Functions From RCM
- Compatible With Ballistic Processor

  For Disturbed Reticle Targeting



CONCEPT IMAGE



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Clip-On Night Vision Device – Heavy (CNVD-H)

- Multiple Mode Selections
- Image Intensification
- Thermal Imaging
- Fusion Mode
- Targets from 0- Max Effective Range
- Maintain Situational Awareness
- External Power and Onboard Back-Up
- Control Of All Functions From RCM
- Compatible With Ballistic Processor For Disturbed Reticle Targeting



CONCEPT IMAGE

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Ballistic Processor Module (BPM)

- 1000m First round Hit Probability of P(hit) = 0.75
- IR Class 1 Laser
- Laser Shall Not Be Detectable With NVE
- Pulse Coded Output To Minimize Jamming
- Range Of 25m To 2200m
- Laser Range Finder Acquisition Time < 1 Second
- Fire Control Solution Of < 3 Seconds
- Will Incorporate Digital Orientation Unit Capable of 3 – Axis Compensation
- External Power and Onboard Back-Up
- Control Of All Functions From RCM



CONCEPT IMAGE

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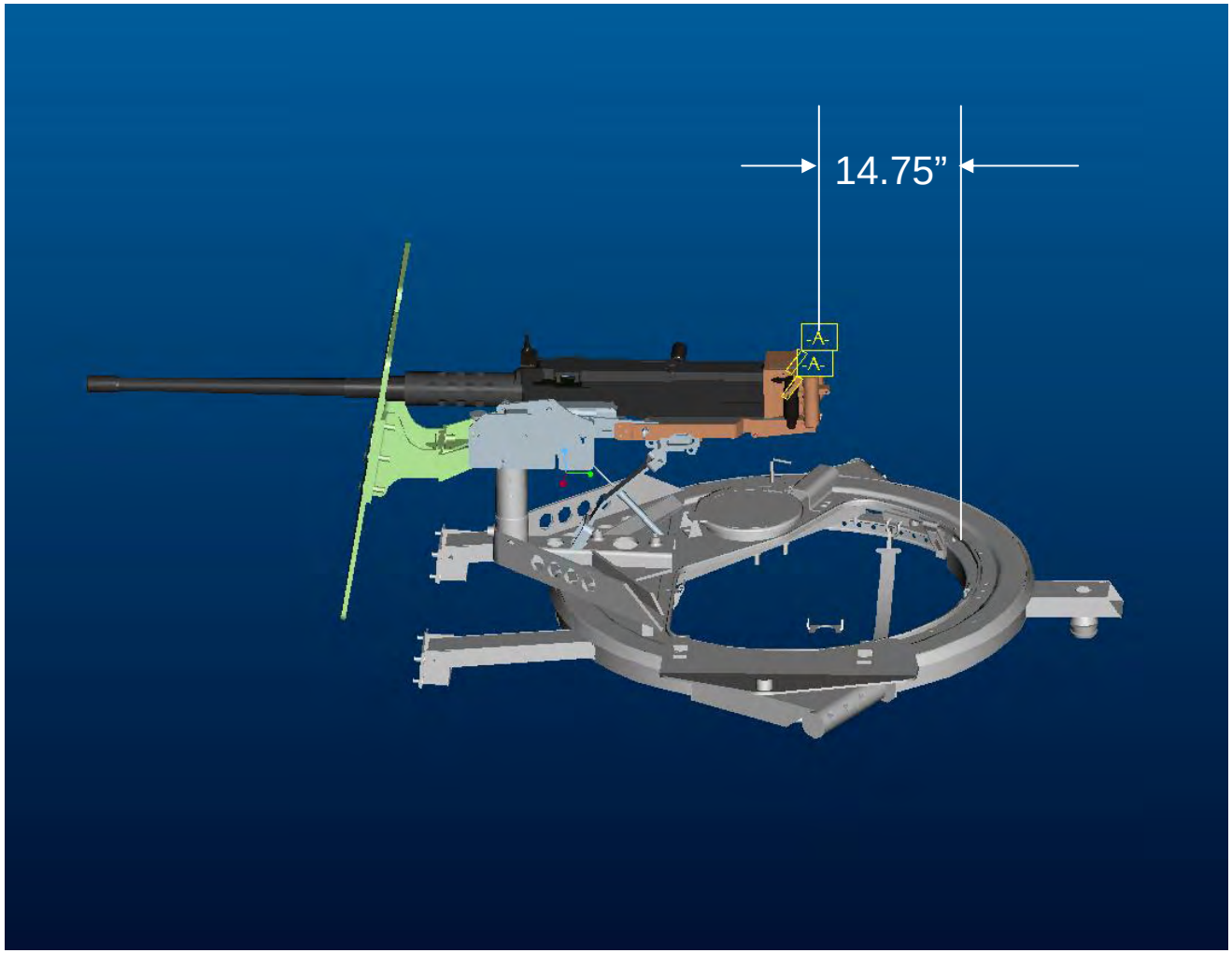
Improved Flash Hider (IFH)

- Mounts to Unmodified M2 Barrel
- Requires No Special Tools
- Reduces Muzzle Flash For Decreased Signature
- Operator NVE Becomes More Effective



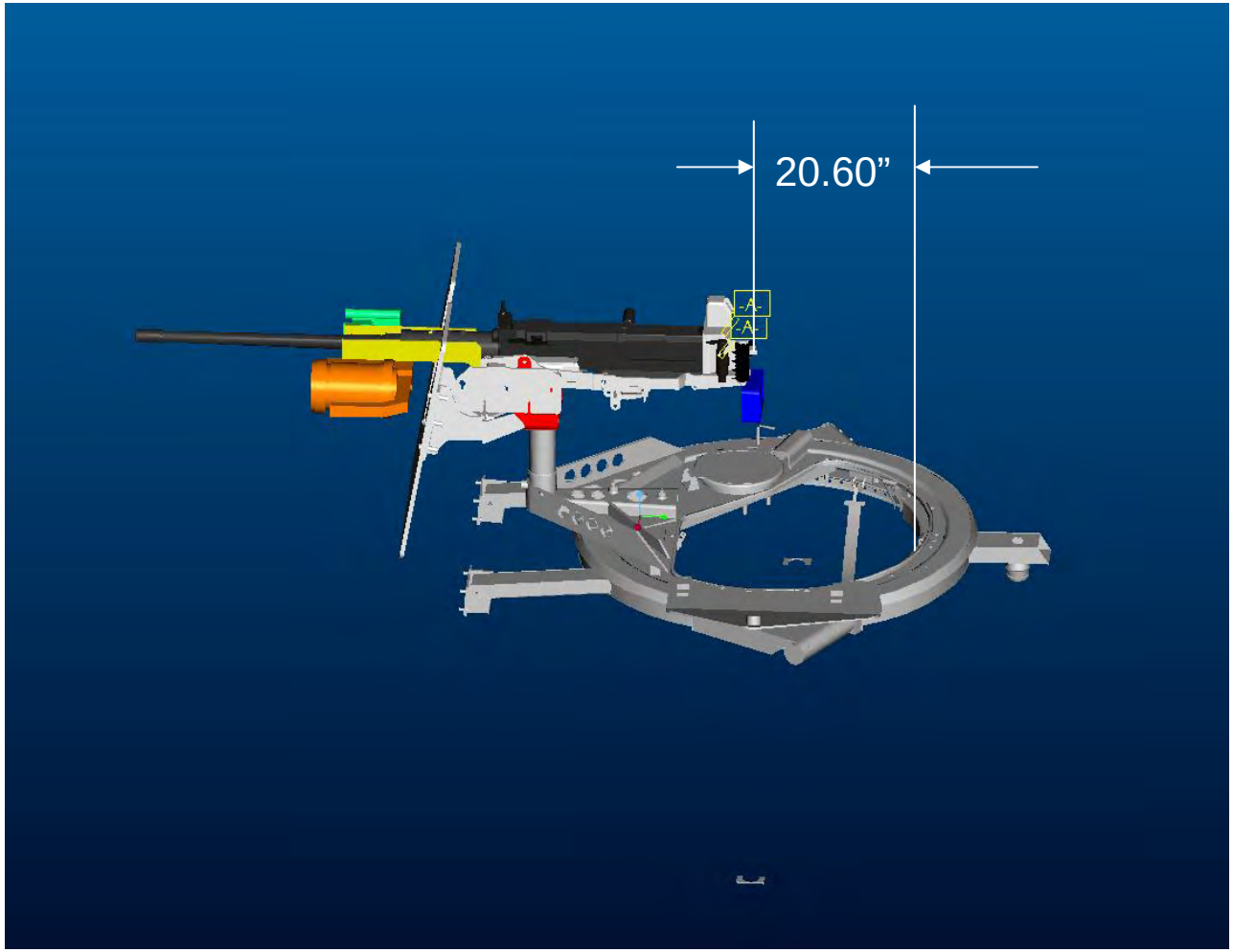
Distribution Statement A - Approved for public release; distribution unlimited.

Existing MK 93 in Turret



Distribution Statement A - Approved for public release; distribution unlimited.

Modified MK 93 in Turret



Distribution Statement A - Approved for public release; distribution unlimited.

Schedule

MDNS-CSW															
	FY06		FY07				FY08				FY09			
Milestones	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q
Draft Specification for Comment				■	■									
Pre-Solicitation Industry Conference		▲	▲											
Release Solicitation						△								
Receive Proposals							△							
Receive Samples									△					
DT/OT Testing										■				
Downselect											△			
Contract Award												△		

Distribution Statement A - Approved for public release; distribution unlimited.

End Result:



Increased Probability of First Round Hit

Distribution Statement A - Approved for public release; distribution unlimited.

Contact Information

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NSWC Crane

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Distribution Statement A - Approved for public release; distribution unlimited.

Knight's Armament Company
TODAY

- 1997 Army Science Board: "Downsize or Die"
  - Colt---Saco---FN—2 max to survive
- Current Industry Strength—on our game
  - Personnel
  - Manufacturing methods
- U.S. Small Arms Performance—overall best
- Difficult to simultaneously:
  - Build weapons at high capacity
  - Develop weapons of the future

Knight's Armament Company
When your life is on the line
…only the finest will do

Knight's Armament Company
VISION AHEAD

- **Emphasis on**
  - **Better Products**
  - **Improved Manufacturing Methods**
- **Qualified Manufacturing Methods**
  - **Consistency in manufacture**

Knight's Armament Company
Challenges for the Future

- Keeping, attracting, & developing talented personnel
- Specialty Metals –making no sense in our global economy
- Government competing with Industry
- Flaws in Military procurement

Knight's Armament Company
When your life is on the line
…only the finest will do

Knight's Armament Company

Challenges—Military Procurement

IN MIND →  CADILLAC

IN NEED OF →  CHEVY

IN POCKET: → 

CAB FARE

Knight's Armament Company
When your life is on the line
…only the finest will do

Knight's Armament Company
OPPORTUNITIES

- Learn now what we need to fix
- After action information flow to Industry
- War ends: Use our talents to develop new systems

Knight's Armament Company
When your life is on the line
…only the finest will do

The Soldier: America's Most Deployed Combat System

PM Crew Served Weapons Overview

for the

Small Arms Symposium & Exhibition

National Defense Industrial Association

7-10 May 2007

BG R. Mark Brown
Program Executive Officer Soldier

COL Carl A. Lipsit
Project Manager Soldier Weapons

Crew Served Weapons























PM Soldier Weapons Programs List

DEVELOPMENT

WEAPONS

1. XM25, Individual High Explosive Air Burst Weapon System Technology Demonstration
2. XM101, Common Remotely Operated Weapon Station (CROWS)
3. Advanced Crew Served Weapon (ACSW) Programs

SOLDIER ENHANCEMENT PROGRAMS

4. XM26, 12 Gauge Modular Accessory Shotgun System (MASS)
5. Future Handgun System
6. Family of Small Arms Suppressors (FoSASS)
7. M68 Close Combat Optics Re-competition
8. XM1116, 12 Gauge Extended Range Non-Lethal Cartridge
9. XM1022, Sniper Ammunition for M107
10. XM110, 7.62 Semi-Automatic Sniper System (SASS)
11. Close Quarters Battle (CQB) Kit
12. XM1041/XM1042/XM1071 - Close Combat Mission Capability Kit (M4/M16/M249/M9/M11)
13. Advanced Sniper Accessory Kit (ASAK)
14. XM320, Grenade Launcher Module (GLM)
15. M2 A12 Quick Change Barrel Kit Program

BLOCK MOD PROGRAMS

16. CROWS-Lightning Remote Weapons Station
17. XM150, Rifle Combat Optic (RCO)
18. M2E2 Machine Gun Lightweight Tripod Program
19. Swing Arm Mount for HMMWVs
20. HMMWV Improved Auxiliary Weapon Mount
21. XM240E6, Medium Machine Gun Weight Reduction Program
22. M249 SAW 200 Round Soft Pack

AMMO BLOCK MOD PROGRAMS

23. XM1037, Short Range Training Round For M4, M16 and M249
24. Lightweight Small Caliber Ammunition
25. Proximity Fuzed Door Breaching Cartridge
26. 40mm Day Night Training Cartridge (FCT)

RFI FY05 ITEMS

- TA31F - 4X ACOG
- Weapon Light
- M24 Small Binoculars
- M122/A1 Tripods
- M249/M240B Spare Barrel Bag
- Three Point Sling
- Improved Spotting Scope With Tripod
- Improved Cleaning Kit
- Improved Buttstock For M4 Carbine
- Forward Grip Bipod
- M203 Day/Night Sight
- Back Up Iron Sight
- M249 Rail
- M240B Rail
- M249 Ammo Soft Pack
- M240B Combat Ammo Pack
- M192 Lightweight Tripod
- M249 Short Barrel
- M249 Collapsible Buttstock
- M4/M5 Modular Weapon System
- M145 Machinegun Optic
- M68 Close Combat Optic

PROCUREMENT

27. M151E1 & M151E2 Protector Remote Wpn System (RWS)
28. MK19, Grenade Machine Gun
29. MK19 MODS
30. Mod Kit
31. Lightweight Adjustable Sight Bracket
32. Tactical Engagement Simulator (TES)
33. M107 Semi Automatic Long Range Sniper Rifle
34. M240B/H/E6, 7.62mm Medium MG
35. M240B MODS
36. M192, Light Weight Ground Mount For MG
37. Improved Bipod
38. M240B Collapsible Buttstock
39. Improved Flash Suppressor
40. Combat Ammunition Pack
41. M240B Short Barrel
42. M240B Improved Buttstock
43. Sling Assembly for the M240B
44. M249, 5.56mm Squad Automatic Weapon
45. M249 MODS
46. M192, Lightweight Ground Mount For MG
47. MG Front Rails
48. Improved Bipod
49. M249 Improved Collapsible Buttstock
50. Short Barrel for the M249
51. Sling Assembly For M249
52. M16A4 5.56mm Rifle
53. M16 Rifle Mods
54. M68 Close Combat Optics (CCO)
55. Close Quarters Battle (CQB) Kit (Production)
56. M4, 5.56mm Carbine
57. M4 Mods
58. M145 Machine Gun Optics
59. M25 Stabilized Binoculars
60. M24 Mini Binocular

AMMO PRODUCTION PROGRAMS*

61. M903/M962 Cal .50 SLAP/SLAPT
62. M1001, 40mm Canister Round
63. M100, Grenade Rifle Entry Munition (GREM)
64. M862 5.56mm Short Range Training Ammunition
65. M1030 12 Gauge Breaching Round
66. M973/M974, 7.62 Short Range Training Ammo
67. M992 IR Illumination Cartridge
68. M281 40mm Target Practice Cartridge

* Programs Managed By PM Soldier Weapons For PEO Ammunition In Accordance With MOA

XM307/ 312

XM307

Description:

- The XM307 Is A Lightweight 2-man Portable Crew Served Weapon Which Will Provide Enhanced Capabilities To The Soldier Improving Lethality And Survivability

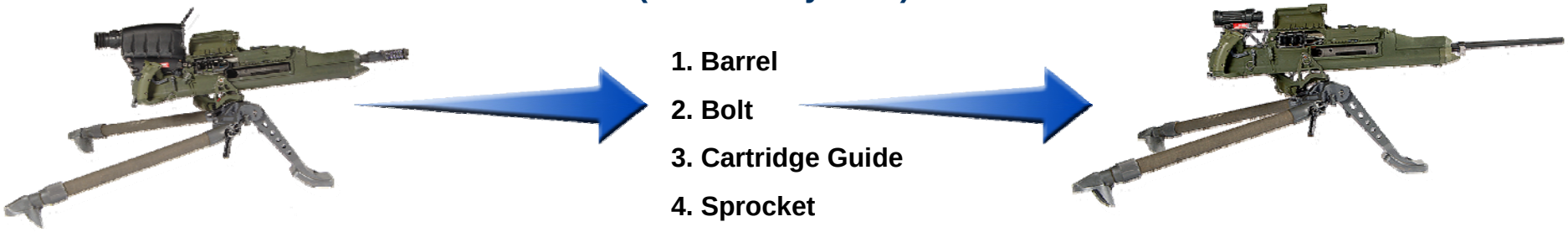
Capabilities:

- Lightweight, 2-man Portable, Crew Served Weapon
- System With 25mm Air Bursting Munitions
- Subsystems Include:
  - Weapon
  - Target Acquisition/Fire Control (TA/FC)
  - 25mm High Explosive Air Bursting And Armor Piercing Ammunition
  - Lightweight Tripod



XM307 And XM312

Swap Out Of Only 4 Unique Components
Required To Convert
A A 25mm Weapon To .50 Caliber Weapon
(<1.5 min By User)



1. Barrel
2. Bolt
3. Cartridge Guide
4. Sprocket

Two Modern Weapons For Virtually the Cost Of One

- Low Recoil Reduces Vehicle Structural Mounting Requirements
- Lower Weight For Improved Transportability & Employment
- Lower Logistic Burden
  - Reduced Maintenance Due To Fewer Parts And Improved Design
  - Smaller Class IX Parts Inventory
- Operational Flexibility With Increased Lethality
- Low Cost Training Capability For The XM307
- Improved Safety & Reduced Maintenance – Soldier Uses One System

XM307 = Commonality With XM312

Mobility

Heavy Firepower For The Close Combat Fight







System	40mm MK19 Mod 3	Cal .50 M2HB	**25mm XM307**	**Cal .50 XM312**
Weapon Weight lbs	**75.6**	**84.0**	**28.0**	**34.0**
Tripod Weight lbs	**65.4**	**46.1**	**13.0**	**18.8**
Fire Control lbs	**N/A**	**N/A**	**6.5**	**N/A**
Unloaded System Weight lbs	**141.0**	**130.1**	**47.5**	**52.8**
Peak Recoil lbs	**800**	**1000**	**250**	**250**

- Low Recoil Burden On Weapon Station
- Quickly Dismountable From Vehicle Platform
  - Portable Over Rough Terrain
- Light & Compact
  - 80-90 lb Weight Savings

Enhances Close Combat Employment Flexibility

XM307/312 Firing

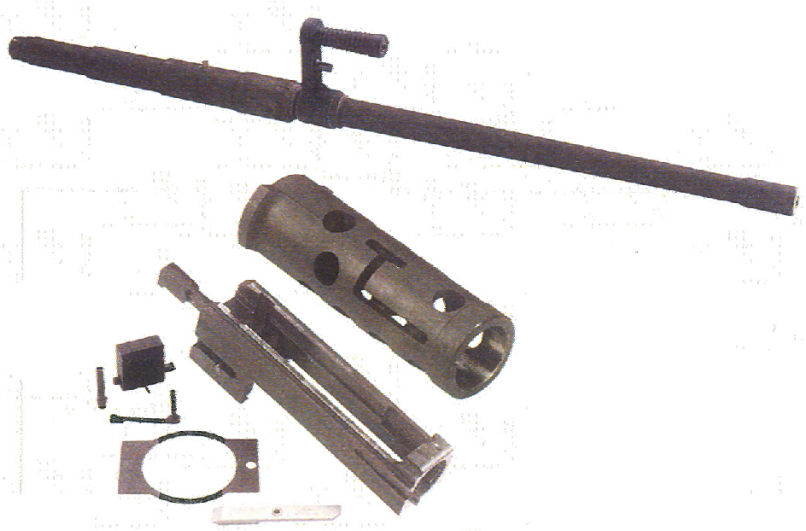


M2 Quick Change Barrel Kit

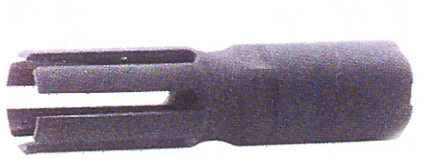
M2E2 System Description

M2E2 Quick Change Barrel (QCB) Kit capabilities:

- Fixed Headspace And Timing To Eliminate Safety Concerns Based On Exposure Time Associated With Barrel Changing
- Flash Hider To Reduce Signature Making The M2 Night-Vision Friendly
- Removable Carrying/Barrel Handle
- Barrel Retention System To Assure Barrel Is Securely Locked And Aligned
- Common Barrel Thread To Interchange With Standard Barrels



QCB Example (Final Design TBD)



Flash Suppressor

M2E2 Enhanced .50 Caliber

Full and Open Competition Strategy (F&OC):

- F&OC Is A Follow-On Effort To The Initial M2E2 Quick Change Barrel Kit Program To Compete The Requirement
- Solicitation To Be Released May 07
- Bid Sample Test Hardware To Be Evaluated; Down Select To One Vendor
- Award RDT&E Contract For Kits To Be Installed On New And Rebuilt M2s
- Conduct Production Qualification And User Assessment
- Proceed To Type Classification–Standard/FRP Decision

M240E6
Lightweight Medium Machine Gun

XM240E6, Medium Machine Gun Weight Reduction Program

Description:

- This Program Will Evaluate High Performance, Lightweight Material Alternatives And Alternate Manufacturing Methods In Fabricating Major M240B Components

Capabilities:

- Reduces The Soldier's Combat Load
- Allows Easier Handling And Movement Of Weapon
- Reduced Weapon Weight By 5 lbs



Status:

Past Events:

- Completed Coating Confidence Test – Sep 06

Current Events:

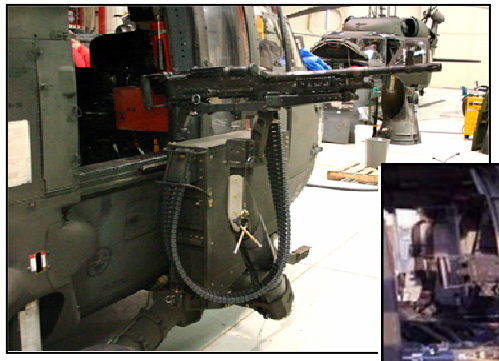
- Developmental Testing – Jan 2007

Next Milestone:

- Type Classification Standard – Aug 2007

M240H Medium Machine Gun

M240H 7.62mm MG
(Aviation Version)





Description:

- 7.62mm Aviation Machine Gun Which Improves The Self Protection Capabilities Of The UH-60 And CH-47 Helicopters

Capabilities:

- Demonstrate Reliability Equal To The M240B
- Removable/Employable In A Ground Role



Pre-Planned Product Improvements (P3I):

- Hydraulic Buffer Added To Spade Grip
- Lightweight Aluminum Ammo Can
- Lightweight Receiver



High Capacity Feed System:

- Provides Two Minutes Of Continuous Suppressive Fire (UH60 Flight Tests May 06)

2,309 Systems Fielded To Date, Fielding Complete End Of FY07

Common Remotely Operated Weapon Station "CROWS"

M151 Protector Remote Weapon System

Weight:

- Above The Roof Including (4) M6 Smoke Grenade Launchers: 279 lbs (w/o M6 Smoke Grenade Launchers: 245 lbs)
- Total Weight: 372 lbs (w/o M6 Smoke Grenade Launchers: 338 lbs)



Supported Weapons:

- MK19, M2, M240 (Deferred)
- Growth To XM307/XM312, MK47 & Javelin

Sensor Suite:

- Color 27x Day Sight
- Dual FOV Night Sight (w/2x E-Zoom)
- Auto Focus
- STORM - Laser Range Finder
- IR Pointer (Low And High)
- Visible Pointer
- Low Ammo Sensor

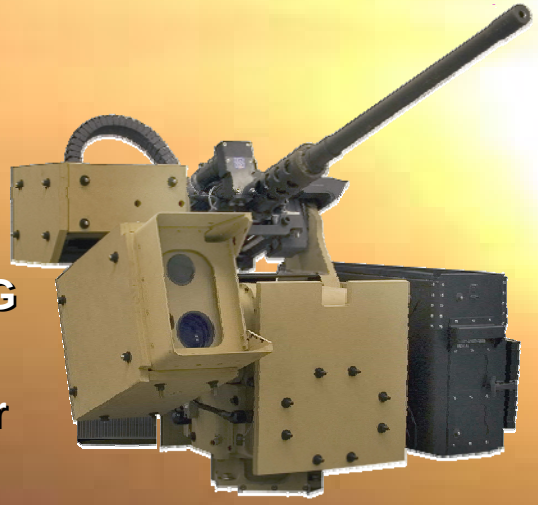
Block II Features:

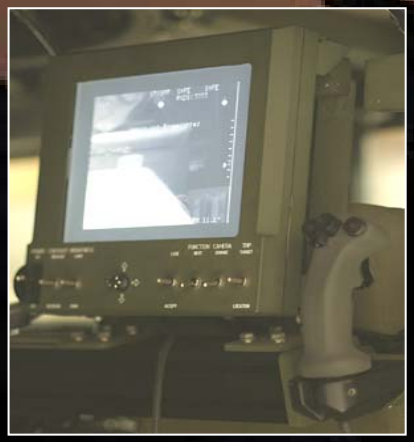
- Stabilized
- Four-axis Independent System – Automatically Corrects For Super Elevation And Drift
- Embedded Training & Diagnostics



Common Remotely Operated Weapon Station (CROWS) Description

- Provide Soldiers With Capability To Acquire And Engage Targets At Maximum Effective Range While Protected By Vehicle Armor
- Supported Weapons
  - MK19 GMG, Cal .50 M2 MG, M249 SAW, M240B MG
  - Growth To M230 & XM307
  - Weapons Can Be Quickly Interchanged By Soldier
- Sensor Suite Supports Day/Night Engagements
- Can Zoom Optics On Target Independent Of Gun Super Elevation
- Two-axis Stabilized Mount, Laser Rangefinder & Fire Control Software Support On-the-move Target Acquisition & First Burst Target Engagements





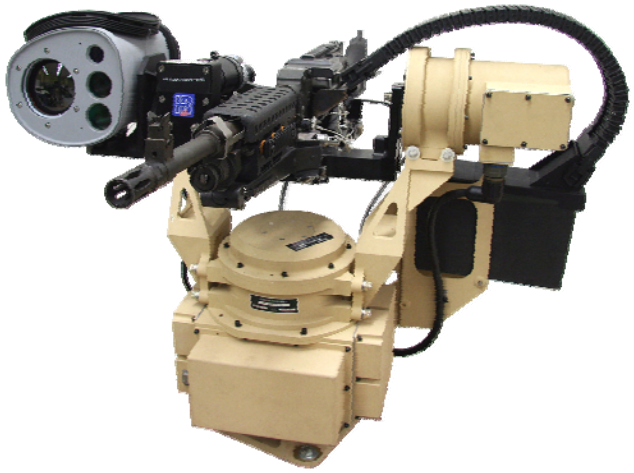


Provides Extended Range Surveillance And Detection Of IED Emplacements

CROWS-Lightning Description



- Lightweight Application For Various Wheeled & Tracked Vehicles (From HMMWVs & Heavy Trucks To Armored Personnel Carriers)
  - 200 lbs Above Roof Including Weapon & Ammo (200 Rds)
- Moves Unprotected Gunners Into Vehicle Interiors
- Day/Night Capability To Identify & Defeat Targets Out To Max Effective Range Of Weapons While On-The-Move
- M240 Or M249 Machine Guns W/Growth To Advanced Crew Served Weapon (XM307)



- Powered By Current Vehicle Capability
- 2-Axis Stabilization
- Traverse: 360° Continuous
- Range Of Elevation: -15° To +45° (Objective: -20° To +60°)
- Slew Rate: >30°/sec
- Safety Features:
  - Programmable Stops In Traverse
  - Manual/Emergency Back-Up Operation Of Weapons Through Top Hatch

M101 CROWS Operations



XM 110 Semi-Automatic Sniper System

XM110, 7.62mm Semi-Automatic Sniper System (SASS)

Description:

- Effective Against Personnel Targets And Light Materiel Targets
- Supplements Sniper's Role In Combat Operations
- Greater Firepower & Possible Standoff Ranges To Improve Sniper Survivability



Capabilities:

- Rapid Fire/Rapid Reload
- Suppressed Sniper Rifle
- Exceeds Rate Of Fire And Lethality Of M24 SWS
- Primarily Anti-personnel Ranges $\geq$ M24 SWS
- Enhanced Sniper Spotting Scope (XM151) And Bipod



Status:

- Preparing For MS C/LRIP
- UMR Fielded To 10th Mtn.

XM110, SASS Specifications

- **Ammunition: 7.62x51mm, M118 LR (Anti-Personnel) And M993 (Armor Piercing)**
- **Barrel Rifling And Twist: 20” Barrel (Not Including Flash Suppressor), 1:11 Right-Hand Twist, 5 Grooves**
- **Muzzle Velocity: 2,571 fps (784 mps) M118LR Ammunition / Barrel Length: 20" (508 mm)**
- **Max Effective Range: 1,000 meters (M118LR Vel: 1,099 fps @ 1km)**
- **Overall Length: 40.5” With Collapsed Buttstock (1028 mm)**
- **Max Height w/20-Rd. Magazine And Day Optic: 10.25" (260 mm)**
- **Rifle Weights Unloaded: w/o Sights/Adapters/Mounts: 10.81 lbs (4.90 kg)**
  - **w/ Front & Rear Iron Sights, Bipod Adapter: 11.06 lbs (5.01 kg)**
  - **w/ Iron Sights, Bipod Adapter, Leupold 3.5 x 10 SASS Scope: 12.82 lbs (5.81 kg)**
- **M110 Complete: w/Leupold 3.5 x 10 SASS Scope, Bipod Adapter w/ LM Type S Bipod: 13.7 lbs (6.21 kg)**
- **Sound Suppressor Weight: 1.96 lbs (.89 kg.), Weapon Length With Sound Suppressor: 46.5” (1,181 mm)**
- **Unloaded 20-Round Magazine: 0.46 lbs (.21 kg)**
- **Magazine w/20-Rounds Of M118 LR: 1.62 lbs (.73 kg)**
- **Bipod LM Type S Weight: 0.87 lbs (.39 kg)**
- **Bipod Adapter Weight: 0.12 lbs (.05 kg)**
- **Leupold 3.5x10x40mm w/ Illuminated TMR(0.5 MOA Elevation & Windage Adjustments) And 30mm SASS Mount: 1.76 lbs (.79 kg.), w/M2 Type (Double Revolution) Ballistic Cam**

Fully Loaded
15.3 lbs



40.5”

Fully Loaded
17.3 lbs



46.5”

XM1041/XM1042, XM1071
Close Combat Mission Capability Kit

XM1041/XM1042, XM1071
Close Combat Mission Capability Kit

Pistol
XM1041



Rifle
XM1042



SAW
XM1071





***Description*:**

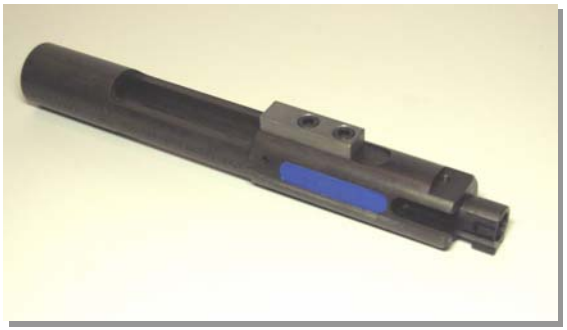
- Mission Rehearsal Exercise (MRE) System Consisting Of The M16/M4/M249/M9/M11 Family Of Weapons, Marker Munitions, And Personal Protective Gear
- Used To Rehearse Force-On-force Close Range Marksmanship Techniques, Tactics, And Procedures (TTP)
- Fires 5.56mm And 9mm Dye-Marker Munitions Through Standard Military Issue Weapons

Capabilities:

- Allows for Realistic Force-On-Force Training
- Identify Shooter And Shot Placement
- Operator Installed
- Must Not Penetrate Skin Thru Hot BDU At 5m(T) And 0M(O)
- Must Not Fire Service Ammo
- Must Not Fracture SWD Goggles At 12 Inches

Close Combat Mission Capability Kit














"Every Soldier is a Rifleman First"
GEN Schoomaker

Back Up Slides

M101 CROWS Ongoing Applications



Integration Into Existing Platforms Is Critical

XM151 Enhanced Spotting Scope & Tripod

- Associated Support Item Of Equipment (ASIOE) To SASS
- Addresses Shortcomings of M144 Scope for the M24 SWS
- Makes RFI Item Army Standard & Supportable



XM107 Urgent Requirement Fieldings

FY02	**150**
FY03	**258**

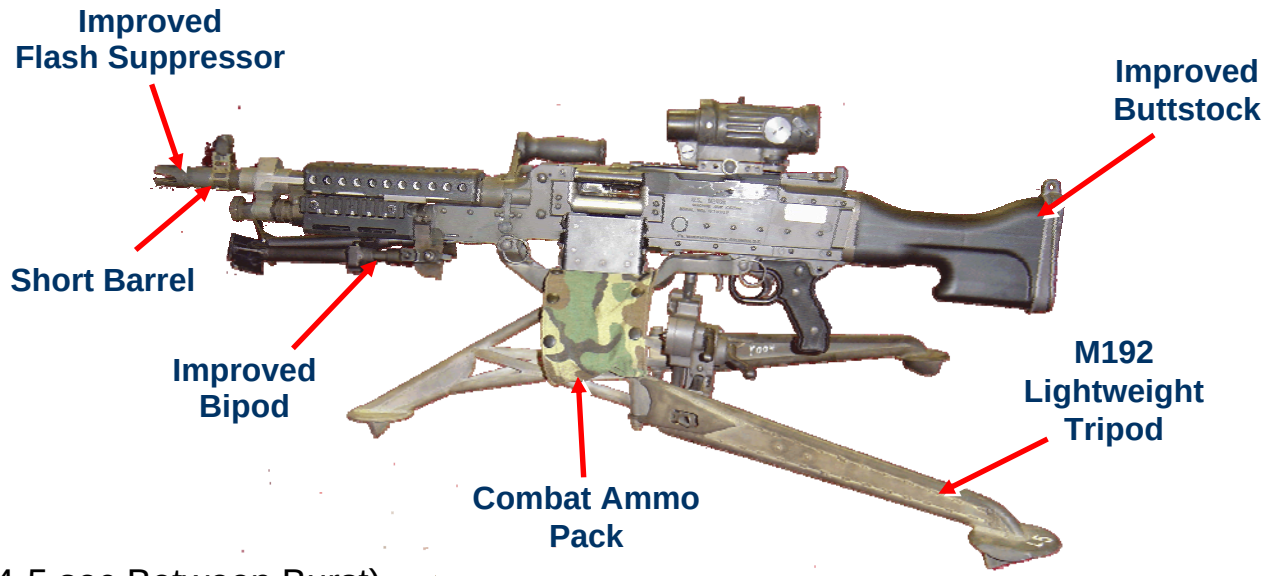
Rapid Fielding Initiative Fieldings

FY03	**24**
FY04	**770**
FY05	**519**
FY06	**1545**
FY07	**948**
FY08	**105**
TOTAL	***4319***



Answers CSA's Edict: **Make RFI Items Army Standard & Supportable**

M240B Medium Machinegun



Weight: 27.6 lbs

***Length*:** 48.5 “

Rate Of Fire:

- Cyclic 650-950 rds/min
- Sustained 100 rds/min (4-5 sec Between Burst)
- Rapid 200 rds/min (2-3 sec Between Burst)

Max Range: 3725m

Max Effective Range:

- 800m (Point Target) w/M122A1 Tripod
- 1800 (Area Target) w/M122A1 Tripod

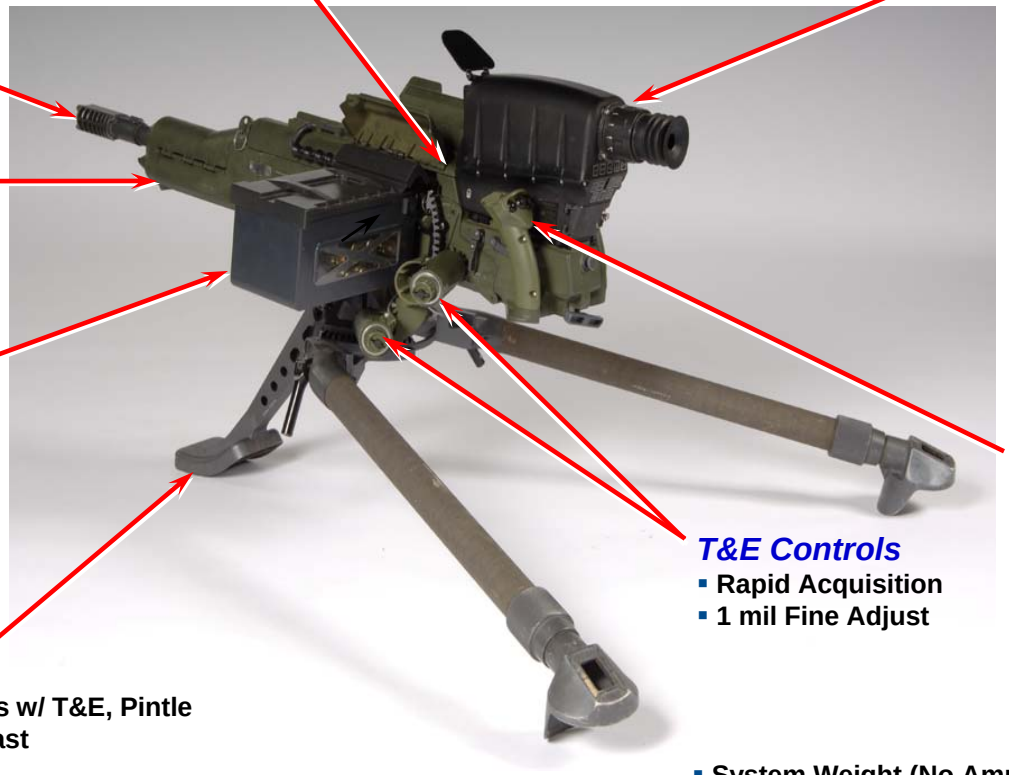
Capability:

- Delivers High Volume Of Fire
- Demonstrates 41,667 MRBS (1800 Req) And 83,000 MRBOMF (15,000 Req)

Target Effects



SDD System Description
(Ground Mounted)



Fuze Setter Contacts

Muzzle Device
- Flash Suppression
- Inherently Reliable

Weapon
- Light Weight, 30 lbs
- 25mm, 260 spm
- Soft Recoil
- Gas Operation

Ammo Can
- Right Or Left Mounted
- Linked Belt
- 31 Round Capacity
- All XM307 Ammo Types

Ground Mount
- Lightweight, 18.8 lbs w/ T&E, Pintle
- Stable Without Ballast
- Height Adjustable

Target Acquisition/Fire Control (TA/FC)
- Direct View Optics (DVO)
- Range Finder/CIDDS/MILES/Pointing Lasers
- CCD Video/FLIR/Tracker Module
- Full Solution Ballistic Calculation/Reticle Aimpoint
- Fuze Programming/Powers And Sets Fuze
- Digital Compass/Environmental Sensors
- 6.5 lbs w/o Thermal

TA/FC Controls
- Grip Mounted Switches
- TA/FC Rear Panel Switches
- Lase & Menu Select
- Increment/Decrement

T&E Controls
- Rapid Acquisition
- 1 mil Fine Adjust

Land Warrior Interface
- Lanyard Style “Breakaway” Connector
- Power, Data And Video Over Interface
- Compliant To LW Requirements

- System Weight (No Ammo): 55.3 lbs Today
- Range: 2000m
- Time Of Flight: 8.9 Sec. To 2000m
- Penetration Requirement (mm RHA): 51mm
- Stowed Kills (200rds): 27.9
- Integrated Full Solution Fire Control

Joint Harmonization of Testing Update



Presented
by

Liliana McShea
Charles Buxton
Bernie Sokolis

Joint Harmonization of Testing

Objective: Identify the necessary tasks required to create a comprehensive, joint test matrix for future non-lethal munition capabilities by combining the testing procedures of the different services into one “harmonized” matrix to prevent the duplication of testing among agencies and expedite the fielding of future capabilities.

Approach: Joint Non Lethal Weapons Directorate (JNLWD) provided funding under the Joint Integration Program (JIP) for the Services including the Naval Warfare Center (CRANE), the Army Test and Evaluation Command (ATEC) and the Air Force Operational Test and Evaluation Center (AFOTEC) to execute the task of harmonizing testing procedures. A Working Level Joint Testing IPT was created to address the Joint Service’s needs relative to service-unique test requirements and to develop the test procedures that best apply to non-lethal munitions.

Joint Harmonization of Testing

Goal: To obtain a Joint Memorandum of Agreement (MOA) wherein the signatories agree to accept test data from each other in accordance with specified joint test procedures

Background and Guidelines

- The test procedures will be for non-lethal small and medium caliber munitions
- The procedures will cover both safety tests and performance tests
- Included will be those procedures most likely to be used across services. Command specific tests (tank vibration, submarine use, helicopter stores, etc) will continue to be done by each service to its own specific requirements
- Existing military standards, such as MIL-STD-331C and MIL-STD-810F should be used wherever possible. However, it may be necessary to modify an existing procedure, or develop a new procedure, to simultaneously satisfy the requirements of all services

Background and Guidelines

- Where possible, the tests should reflect current procedures and support historical databases. They should be economical to perform and minimize investments in specialized equipment

- Each service and command is encouraged to add test procedures needed to support their missions and to comment on proposed procedures

- Each service should concur or non-concur with each proposed procedure or change to a procedure. These concurrences will serve as the basis for the final recommendations and justifications to support the Memorandum of Agreement (MOA)

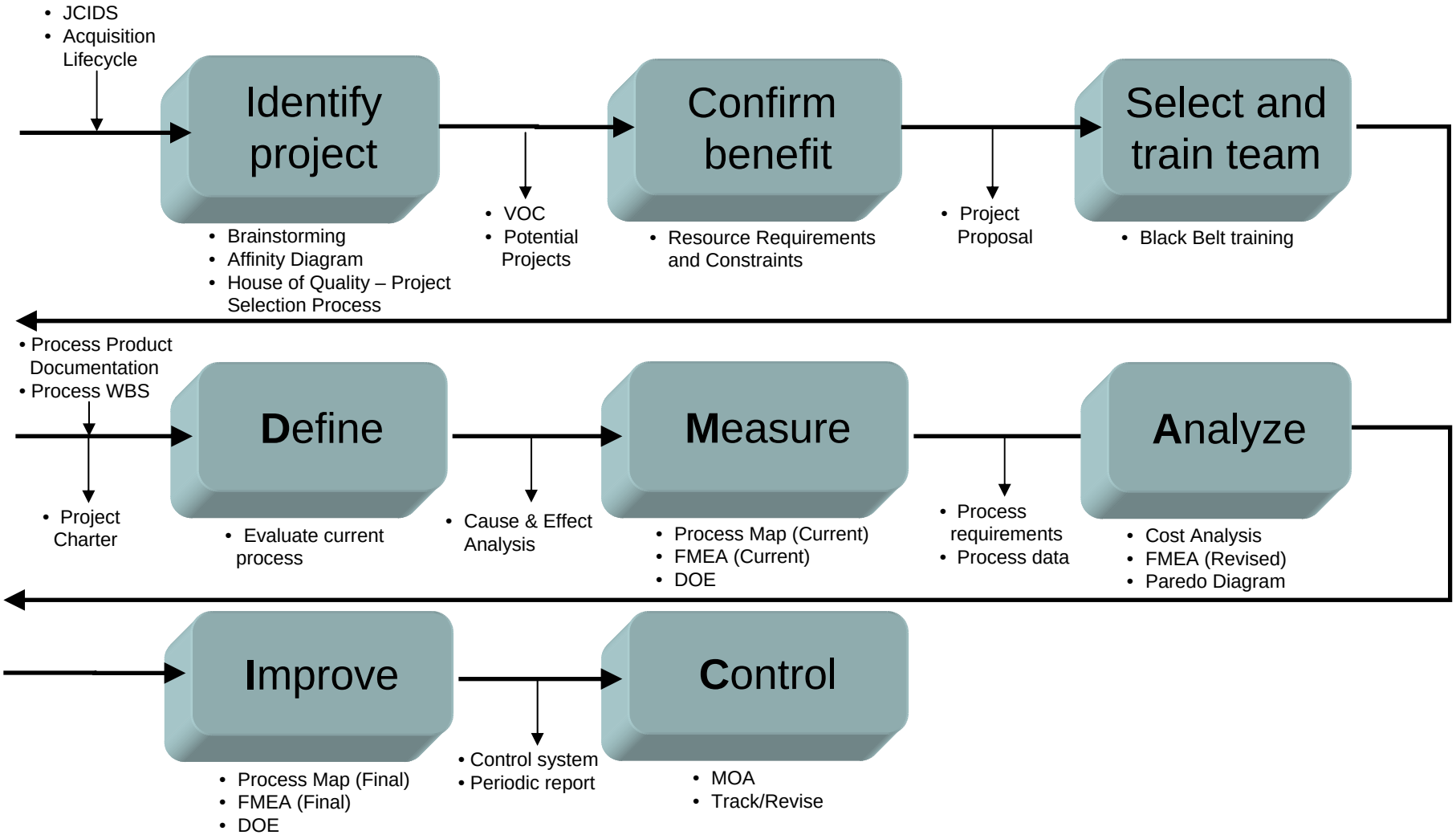
Accomplishments

- Draft test matrixes completed and concurred at the IPT level
- Initiated 2nd level review (division level) with comments due back by 25 May 07
- Teamed with the Fuze Working Group to leverage their test matrices for fuzed munitions qualification
- Included Human Center of Excellence (HECOE) and the USA Center for Health Promotion and Preventive Medicine (USACHPPM) as part of the IPT to include human effects testing procedures in the test matrices

Future Activities

- Resolve any questions or comments arising from the 2nd level review.
- Consolidate comments, finalized test matrix and staff MOA for Service/Test Agency approval by June 2007
- Conduct Six Sigma Project to establish joint testing process for non-lethal munitions
- Initiate Joint Harmonization of testing for small arms munitions under the Joint Service Small Arms Program (JSSAP) sponsorship

Project Map for Lean Six Sigma Project



Test Procedure - Before

Test No. 15, Electrostatic Discharge
POTENTIAL PROCEDURES

Specification Parameter	MIL-STD-331C. Test F1.2, Personnel-borne	MIL-STD-331C. Test F1.2, Helicopter-borne (bare)	STANAG 4239, Electrostatic Discharge, Munitions Test Procedures, Personnel	STANAG 4239, Electrostatic Discharge, Munitions Test Procedures, Helicopter
Preconditioning	Minimum 24 hours at 23°C±10°C at less than 50% relative humidity	Minimum 24 hours at 23°C±10°C at less than 50% relative humidity	Minimum 24 hours at 23°C±10°C at less than 60% relative humidity	Minimum 24 hours at 23°C±10°C at less than 60% relative humidity
Test conditions	23°C±10°C at less than 50% relative humidity	23°C±10°C at less than 50% relative humidity	23°C±10°C at less than 60% relative humidity	23°C±10°C at less than 60% relative humidity
Fuze Configuration	Bare fuze completely assembled (modifications permitted under certain conditions), fuzes attached to their associated weapon, if practical	Bare fuze completely assembled (modifications permitted under certain conditions), fuzes attached to their associated weapon, if practical	Fully assembled with live electroexplosive devices (EEDs); exact configuration of the test item shall be determined from the life cycle analysis.	Fully assembled with live electroexplosive devices (EEDs); exact configuration of the test item shall be determined from the life cycle analysis.
Sample size	22 minimum	22 minimum	20 minimum	10 minimum
Discharge energy	25±5% kilovolts (both polarities), capacitance 500±5% picofarads, resistance 5000±5% ohms with test repeated at 500±5% ohms.	300±5% kilovolts (both polarities), capacitance 1000±10% picofarads, resistance one ohm maximum	25±5% kilovolts (both polarities), capacitance 500±5% picofarads, resistance 5000±5% ohms with test repeated at 500±5% ohms.	300±5% kilovolts (both polarities), capacitance 1000±10% picofarads, resistance one ohm maximum

REVIEWING AGENCY COMMENTS
Reviewing Agency: Aberdeen Test Center

Procedure	MIL-STD-331C. Test F1.2, Personnel-borne	MIL-STD-331C. Test F1.2, Helicopter-borne (bare)	STANAG 4239, Electrostatic Discharge, Munitions Test Procedures, Personnel	STANAG 4239, Electrostatic Discharge, Munitions Test Procedures, Helicopter
Comments:			NATO document AOP 24 recommends ESD testing “at as low a relative humidity as can be reached”; it also gives considerations for the life cycle analysis.	
Concur/Non-concur:				

Test Procedure – After

Summary: This test determines the munition's resistance to static electricity discharges encountered during handling.

Procedure: MIL-STD-331C. Test F1.2, Personnel-borne and also Test F1.2, Helicopter-borne

Procedure Summary

Specification Parameter	**Requirement, Personnel-borne**	**Requirement, Helicopter-borne (bare)**
Preconditioning	Minimum 24 hours at 23°C±10°C at less than 50% relative humidity	Minimum 24 hours at 23°C±10°C at less than 50% relative humidity
Test conditions	23°C±10°C at less than 50% relative humidity	23°C±10°C at less than 50% relative humidity
Fuze Configuration	Bare fuze completely assembled (modifications permitted under certain conditions), fuzes attached to their associated weapon, if practical	Bare fuze completely assembled (modifications permitted under certain conditions), fuzes attached to their associated weapon, if practical
Sample size	22 minimum	22 minimum
Discharge energy	25±5% kilovolts (both polarities), capacitance 500±5% picofarads, resistance 5000±5% ohms with test repeated at 500±5% ohms.	300±5% kilovolts (both polarities), capacitance 1000±10% picofarads, resistance one ohm maximum

Comments: Both the personnel-borne and the helicopter-borne tests are required to satisfy the electrostatic discharge test.

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  (410) 278-2827

Questions?

Modeling and Evaluation of the Human Torso

Joint Services Small Arms Systems Annual Symposium, Exhibition & Firing Demonstration May 7-10, 2007

Andrew C. Merkle[1] and Jack C. Roberts[1,2]

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Baltimore, Maryland 21218-2686

Background

- Soft armor vests are an essential component of personnel protection
  - Prevent penetration of tissue piercing ballistics into the thoracic region
- The use of strong, deformable materials provide ballistic resistance
  - Allows backface deformation; augmented by higher energy threat conditions
  - Potential for Behind Armor Blunt Trauma (BABT)
- Need to understand the relationship between the mechanical insult and the risk of internal injury



High-rate Blunt Impact Research

- Recognized need for evaluating soft armor vests and investigating BABT
  - NIJ Standard 0101.04 – ballistic resistance
  - Ballistic gelatin – energy transfer
    - *van Bree (1998, 2000); Lyon (2000)*
  - Animal models – physiological response of living tissue
    - *Liden (1988); Baosong (1996); Yen (1998)*
  - Post Mortem Human Subjects (PMHS) – develop injury criterion
    - *Viano (1988); Bir (2003, 2004); Sturdivan (2004)*
  - Computational Models
    - *Wang (1995), Plank (1998), Roberts (2005)*
  - Physical Surrogate Models
    - *Lyon (1999), Roberts (2006)*

Motivation

- Investigate the ability of the torso models to
  - Detect the transfer of impact energy to the thoracic tissues
  - Measure potential injury risk predictors
  - Evaluate influence of factors including
    - Impact location
    - Surrounding local environment
    - Remote tissue response
- Compare the torso model response trends with the clay deformation observed from similar impact conditions

Goal

Understand human thorax response to blunt ballistic impact

↘

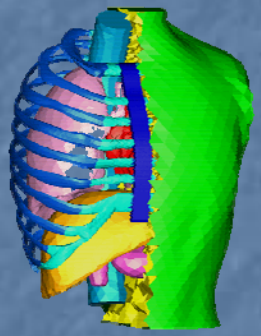
Establish Injury Criteria based on BABT injury risk

↘

Assess incapacitation from resulting injuries; contribute to the development of optimal engagement equipment

Approach

- Create both a computational and physical human torso model
  - Human Torso Finite Element Model (HTFEM)
  - Human Surrogate Torso Model (HSTM)
  - Current models complete with:
    - Skeletal Structure (ribs, sternum, cartilage and vertebral column)
    - Organs (lungs, liver, heart, and stomach)
    - Soft tissue (muscle, skin, viscera)



HTFEM



HSTM

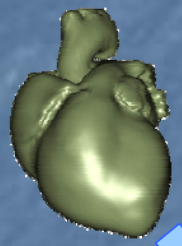
Approach (cont.)

- Simulate ballistic impacts on HTFEM
  - Obtain deformations, organ pressures and acceleration of sternum
- Conduct ballistic experiments on HSTM
  - Obtain organ pressures and sternal acceleration
- Validate model response
- Employ models in understanding torso response under various threat conditions
  - Flexibility of computational or experimental evaluation

Model Development

Human Geometry

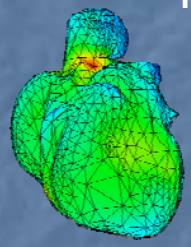




Rendered Digital Model

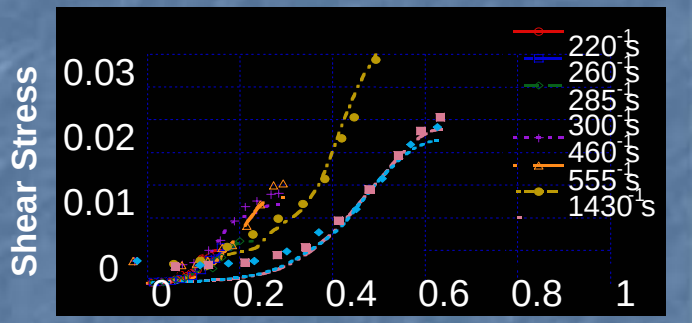
Rapid Prototype/ Physical Model



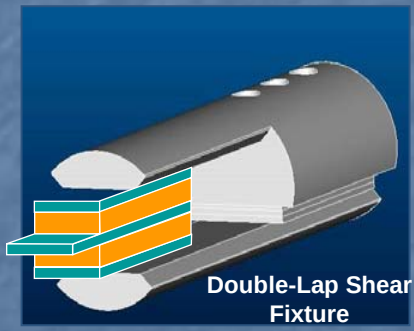


Finite Element Model

Biosimulant Tissues



High-rate Tissue Testing





HSTM

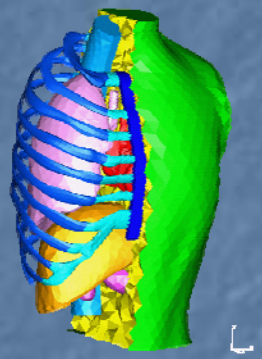
HTFEM



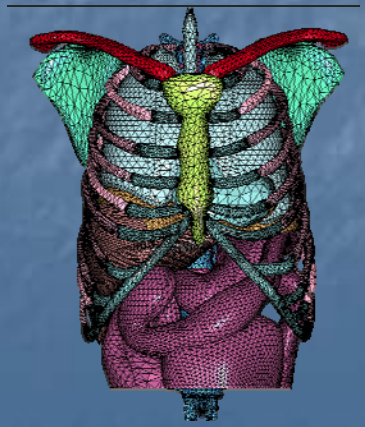
Human Torso Finite Element Model (HTFEM)



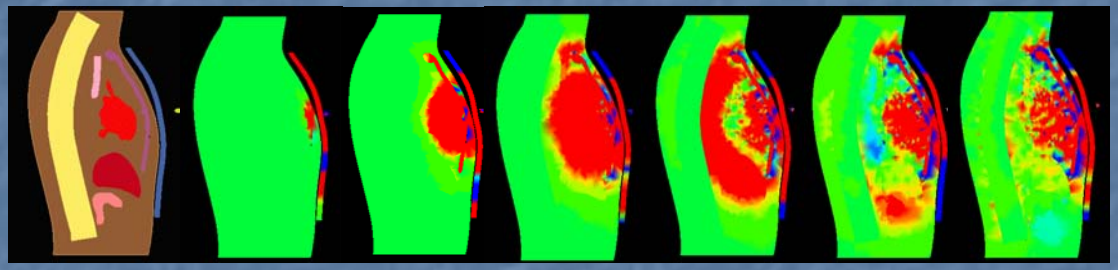
5th Percentile HTFEM



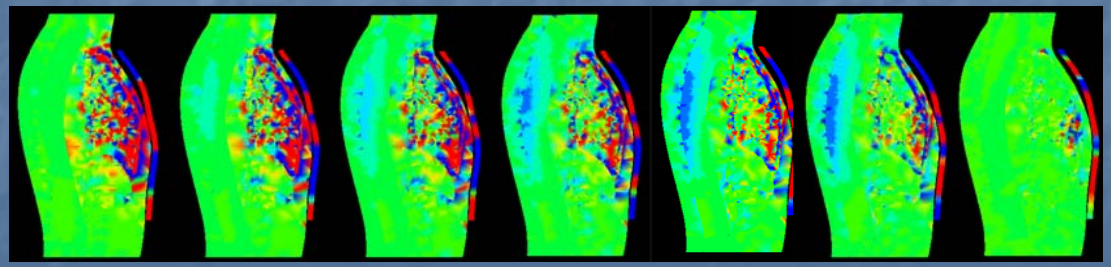
50th Percentile HTFEM



9 mm; 425 m/s; Sternal shot location



T= 0.0 ms .20 ms .25 ms .30 ms .35 ms .40 ms .50 ms

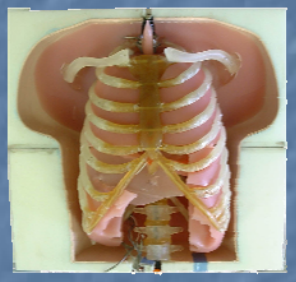


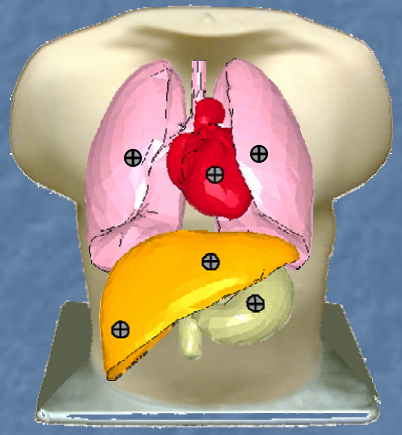
T= .75 ms 1.00 ms 1.25 ms 1.50 ms 1.75 ms 2.00 ms 5.00 ms

Human Surrogate Torso Model (HSTM)

- Fabricated from biosimulant materials
  - Organ material properties evaluated under high strain-rate materials testing
  - Bone simulant material
- HSTM instrumented with sensors
  - Pressure sensors in organs
  - Accelerometer on sternum
  - Load cell in vertebral column













A Look Inside the HSTM







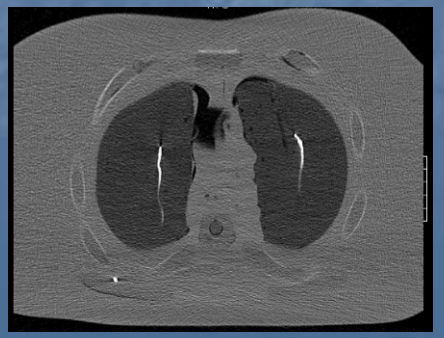
Intestinal cavity



Liver



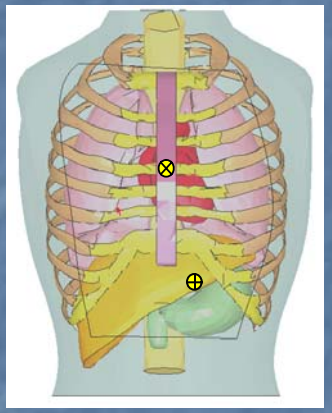
Heart



Lungs

Ballistic Impact Conditions

- Shot Locations
  - Sternum: 1 in. superior to the vertical level of T6
  - Stomach: 1 in. lateral to mid-line and slightly superior of stomach



- Threat conditions
  - NIJ Standard 0101.04 test conditions
  - Soft armor only

Vest Type	Caliber	Ammo Mass (grains)	Impact Velocity (ft/s)
I	.22	40	1079
IIa	9-mm	124	1119
II	9-mm	124	1204
IIIa	9-mm	124	1430

Experimental Methods

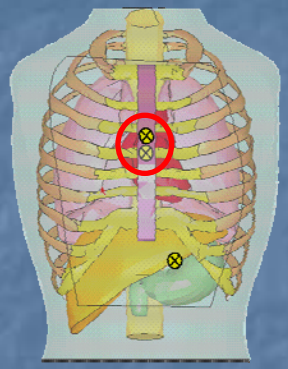
Impact over the Sternum

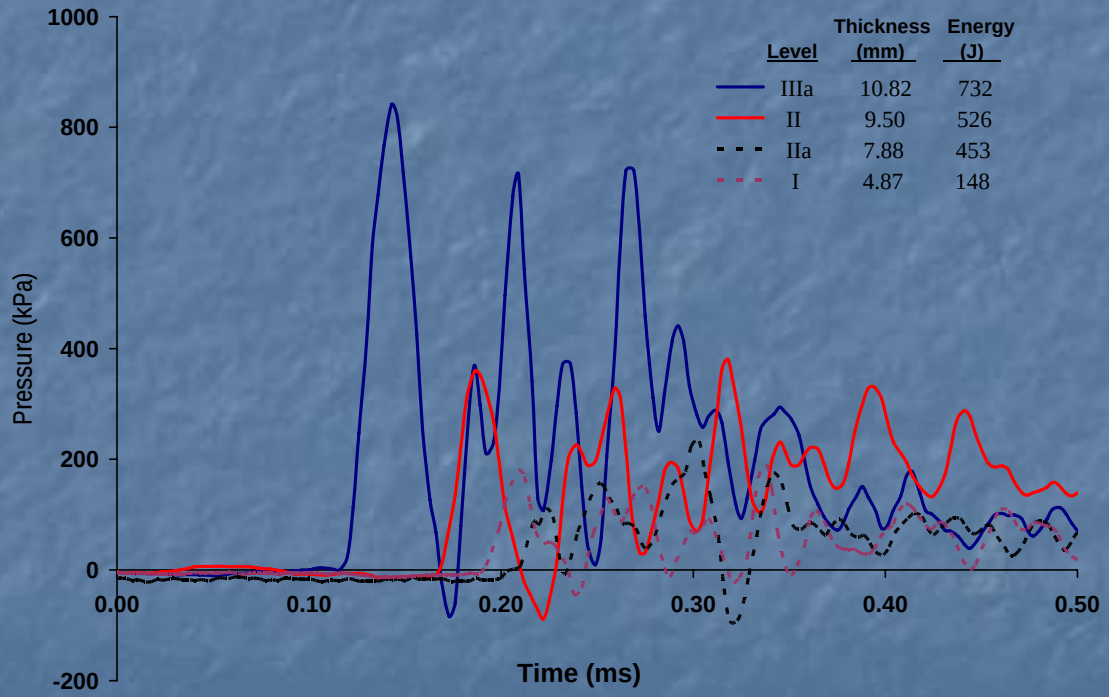
Level II vest; 9 mm bullet; IV = 1180 ft/s



Experimental Results

Sternum Impact Location (Heart sensor response)



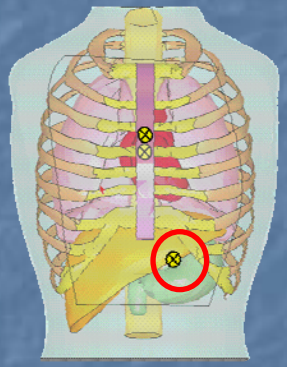


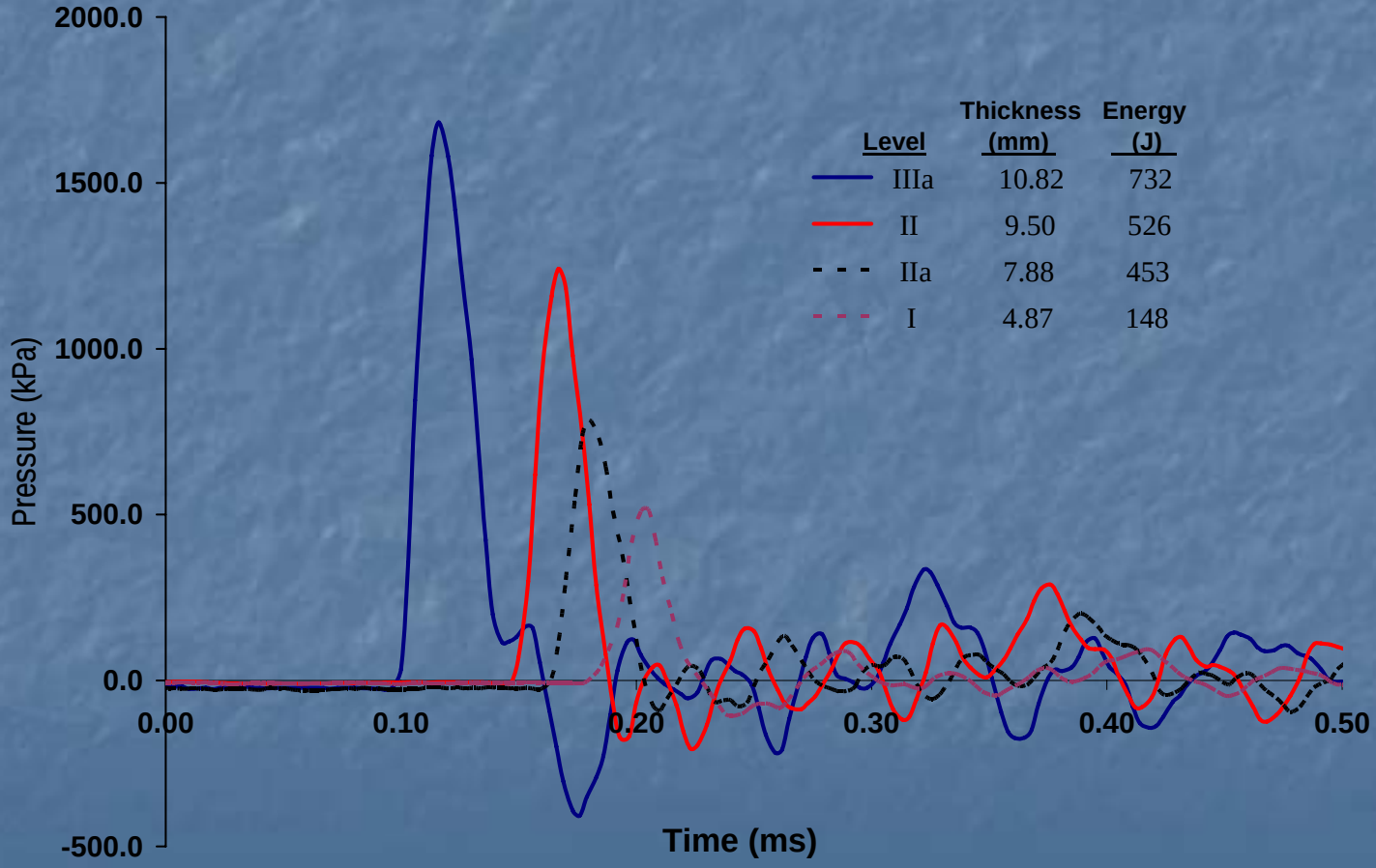
	Heart	
Test Level	Pressure (kPa)	dP/dt (kPa/ms)
I	181	10170
IIa*	111	11412
II	359	18360
IIIa	841	32260

* Impact location approximately 1” low

Experimental Results

Stomach Impact Location
(Stomach pressure response)





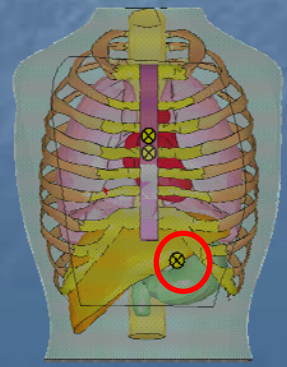
Level	Thickness (mm)	Energy (J)
IIIa	10.82	732
II	9.50	526
IIa	7.88	453
I	4.87	148

Experimental Results

Stomach Impact Location

(Stomach and Liver response)

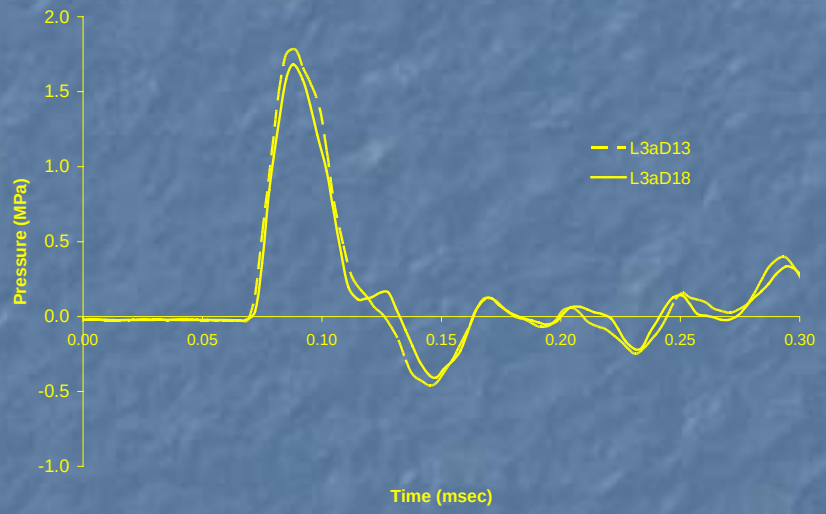
	Stomach		Liver – Left Lobe		Liver – Right Lobe	
Test Level	Pressure (kPa)	dP/dt (kPa/ms)	Pressure (kPa)	dP/dt (kPa/ms)	Pressure (kPa)	dP/dt (kPa/ms)
I	517	25500	310	17700	69	4000
IIa	779	39400	469	33200	145	13500
II	1241	69200	979	65500	269	22300
IIIa	1682	98900	1406	69030	496	27800



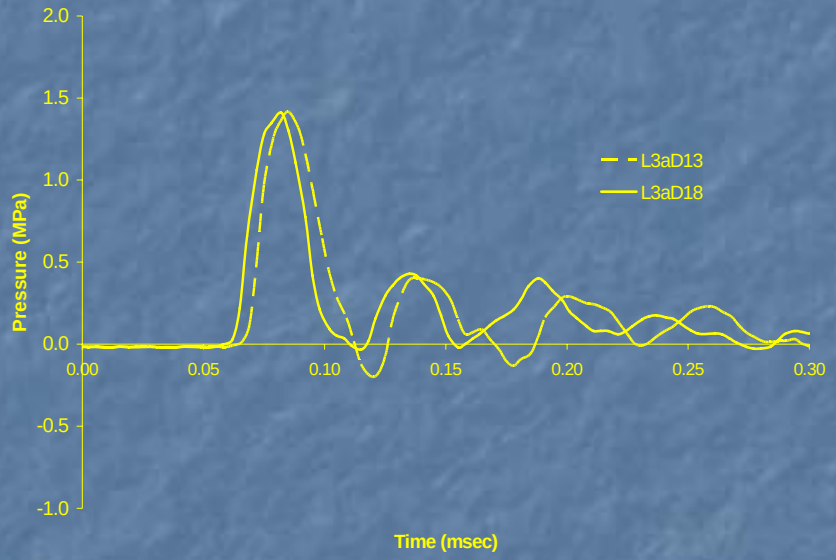
Repeatability

9 mm Bullet at 1410 ft/s

Level IIIa Soft Armor Vest



Stomach



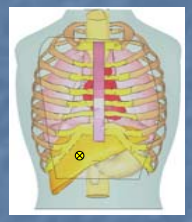
Left Lobe of the Liver

HSTM vs. HTFEM

(Left Lobe of the Liver)

9 mm bullet at 1090 ft/s

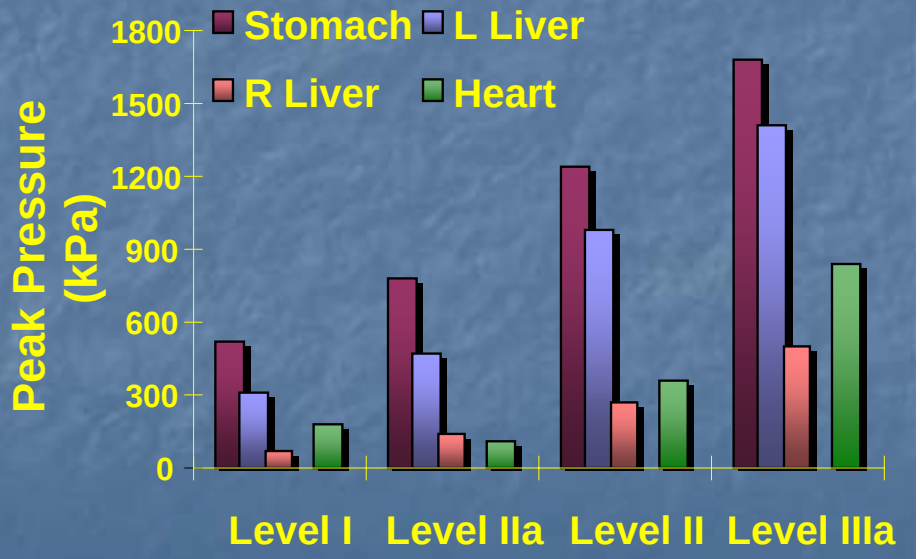
Level II soft armor vest



Discussion

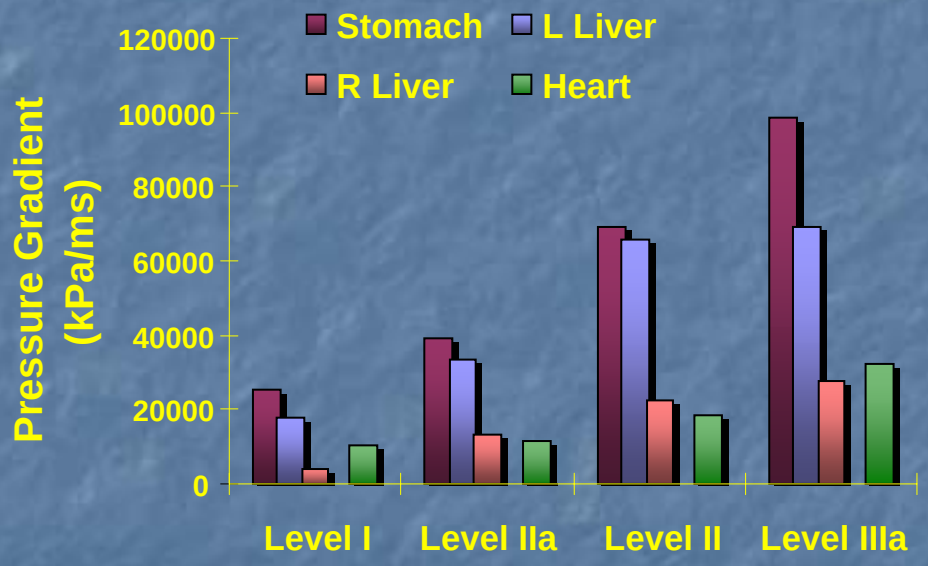
- Increasing severity of impact conditions produced rising initial peak pressures*
  - Heart: $P_{LIIIa} = 4.5 \times P_{LI}$
  - Stomach: $P_{LIIIa} = 3.25 \times P_{LI}$
  - Vest thickness increase does not completely counteract impact energy increase

- Pressures from sternal impacts less than those from stomach impacts
  - Bony structure dissipates energy
  - Produces triple pressure spike
- Peak pressure reduced in liver versus stomach



Discussion

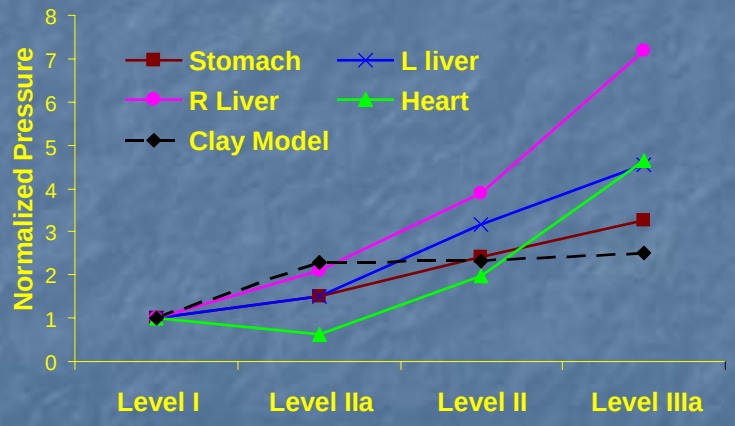
- Increasing severity of impact conditions produced increasing rates of pressure change (dP/dt)
  - Follows trends similar to pressure peaks



Discussion

- Clay/vest FEM validated for Level II impact
  - Model adapted to produce Level I, IIa, and IIIa clay displacements due to vest Backface Signature (BFS)
  - All vests “passed” since 44 mm BFS level not exceeded
- Normalized values based on Level I results
  - Pressure increases at a much steeper rate with each change in test condition
  - Clay deformation change decreases with increased test conditions

Test Level	Clay Deformation (mm)
I	14.5
IIa	33.4
II	33.8
IIIa	36.4



Conclusions

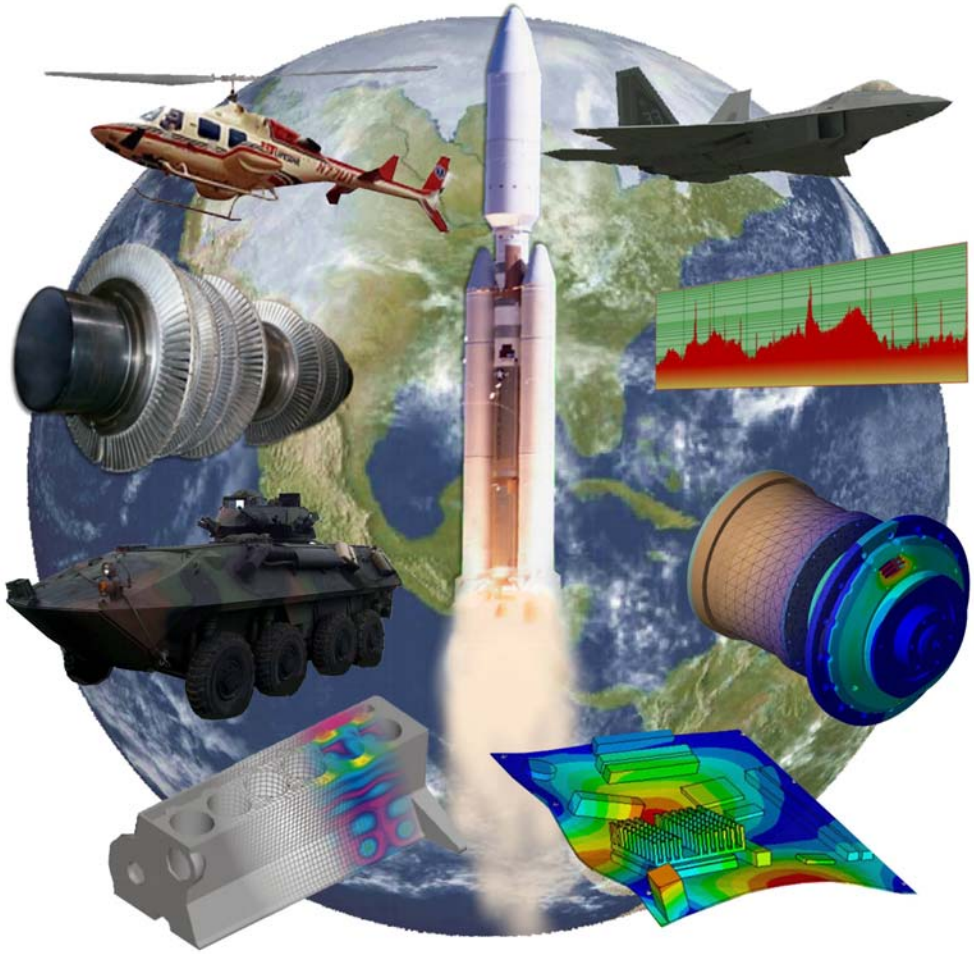
- Surrogate torso models have been evaluated under NIJ-Standard 0101.04 impact conditions
  - Provides dynamic measurement of impact response
  - Differentiates between the severity of impact conditions
  - Demonstrates sensitivity to impact location
- Greater impact energy results in disproportionately greater increase in organ pressure versus clay deformation
- Torso models may provide additional information in assessing incapacitation from resulting injuries
  - Contribute to the development of optimal engagement equipment
- Future work:
  - Understand ceramic plates
  - Transfer function between PMHS injury and torso model response
  - Further development of biosimulant materials to improve model biofidelity

Acknowledgments

The authors would like to acknowledge the
Office of Naval Research (ONR)
for supporting this research under contract awards
N00014-03-PD-2-0010
and
N00014-04-PD-2-0279(1)

Mechanical Solutions, Inc.
Engineering Analysis, Test & Technology

40 mm Less Lethal Munitions



Prepared for:

NDIA Joint Services Small Arms Systems Annual Symposium, Exhibition, & Firing Demonstration

Virginia Beach, VA

***Prepared by*:**

Keith Olasin

Paul Boyadjis

7-10 May 2007

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MSI Company Background

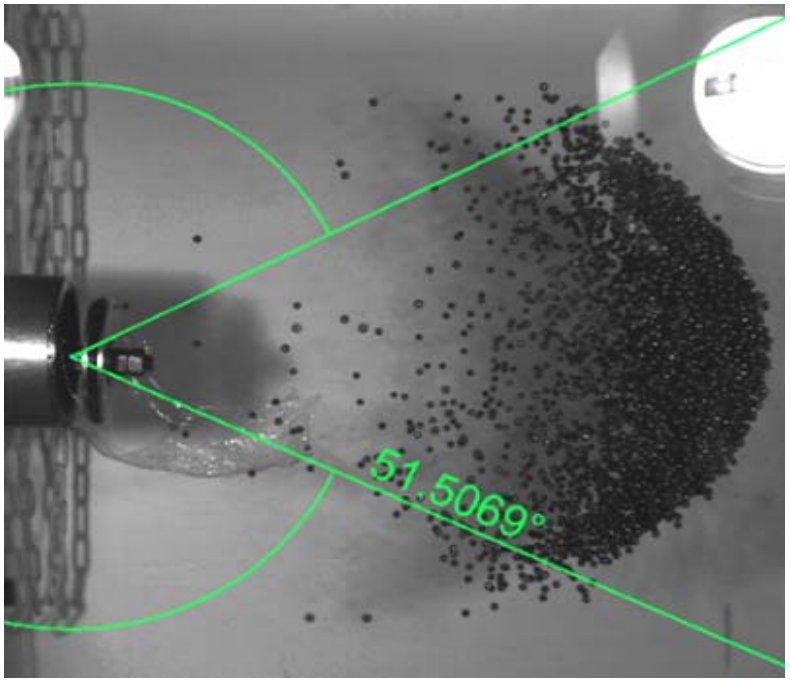
Mechanical Solutions, Inc.
Engineering Analysis, Test & Technology

1996 – Company Founded as NJ S-Corp

2000 – Filtration Solutions, Inc. (Wharton, NJ)
Spun Off as an SBIR Commercialization

2002 – US Dept. of Commerce Best
Technology Small Business in NJ

2007 – MSI record of SBIR commercializations
>80% of Phase I's awarded Phase II



Launch-tube testing at MSI of RPG-Defeat ShotScreen™ munition

Core Competency:

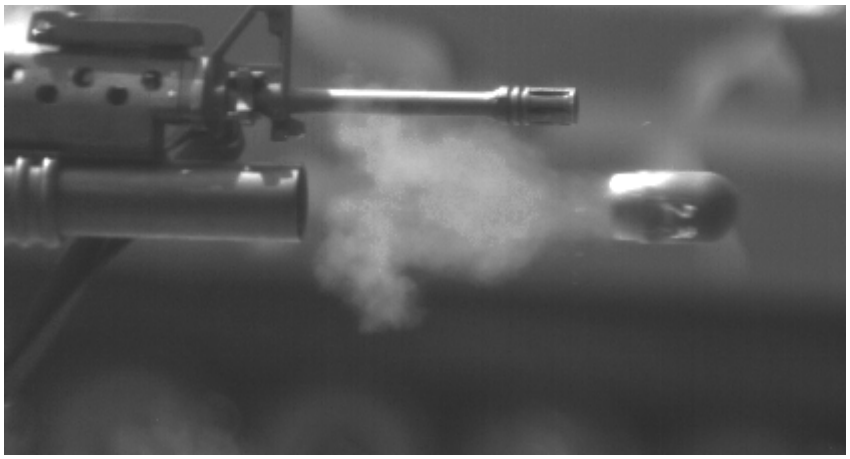
Less-Lethal Munitions Design & Development

40 mm Non-Lethal SafeShot™ Round

Mechanical Solutions, Inc.
Engineering Analysis, Test & Technology

Paul Boyadjis, PI





- ***Fires from standard M203 launcher***
- ***Demonstrated effective up to 100 meters***
- ***Replacement for M1006 sponge grenade***
- ***Marker-round option***

40 mm Non-Lethal Round Goals

Mechanical Solutions, Inc.
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- ***Extend range of the 40 mm non-lethal to 100 m***
- ***Exceed current M1006 Sponge grenade accuracy at 50 m. of 65% hit rate***
- ***Determine a standard hit rate at 75 m where none currently exists for the M1006 (Minimum of 65% at 75 m)***
- ***Impart greater impact energy at 50 and 75 m than is currently delivered by the M1006***

MSI's 40 mm SafeShot™ Projectile

Mechanical Solutions, Inc.
Engineering Analysis, Test & Technology

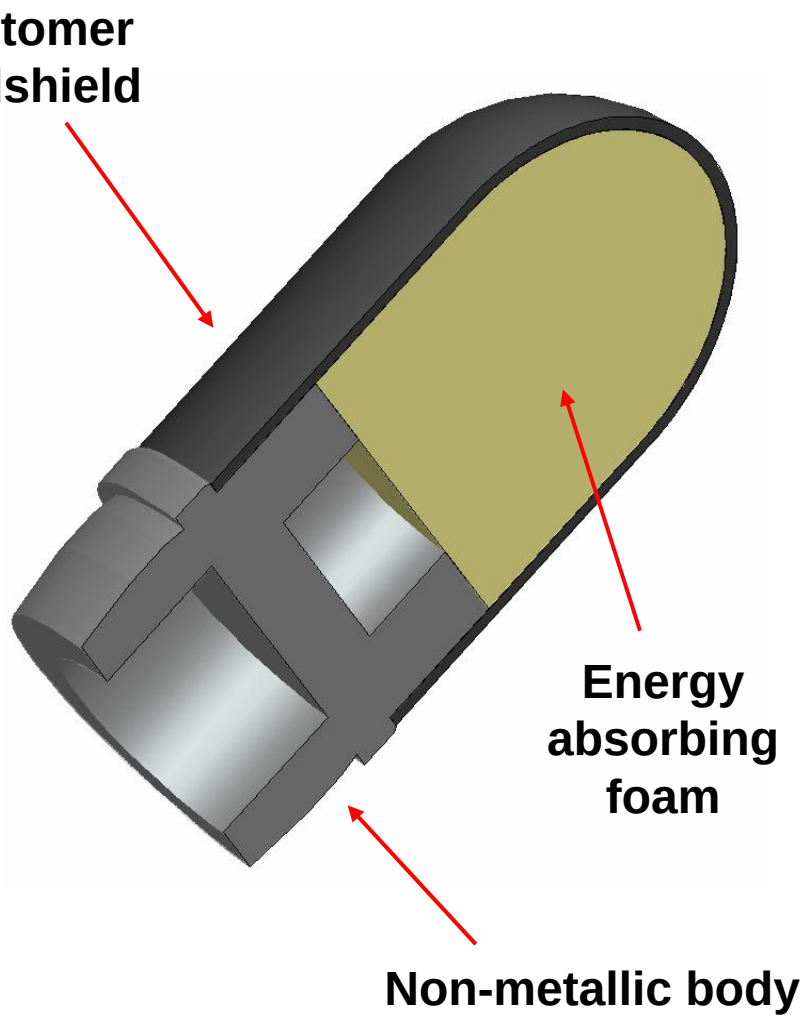
Weight = 51.5 grams

Powder charge = 170 mg Bullseye with standard hi/low adapter

Average muzzle velocity = 235 fps

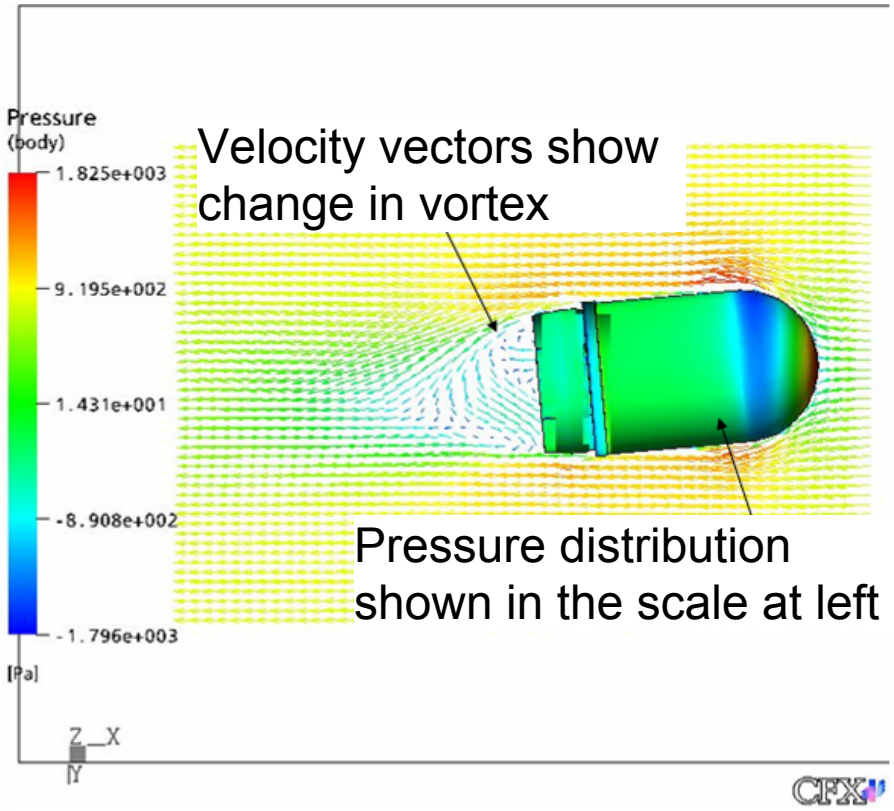
Calculated muzzle energy = 97 ft*lbs

Average ballistic clay depth = 1.685" (2.7% below limit of 1.732" at 10m)

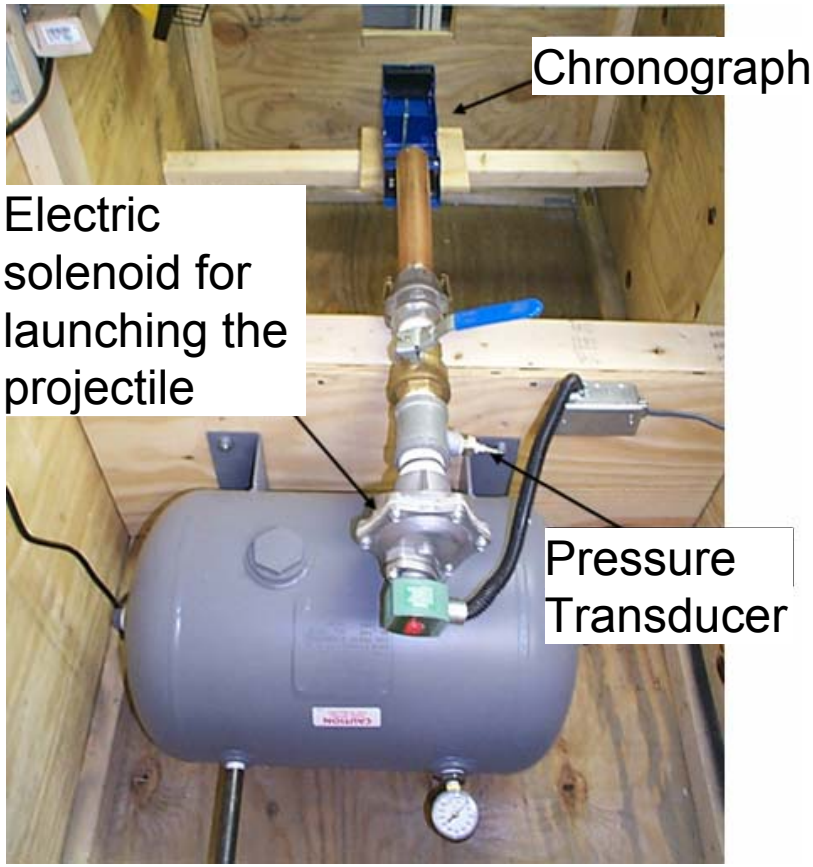


MSI's Projectile Analysis & Test

Mechanical Solutions, Inc.
Engineering Analysis, Test & Technology



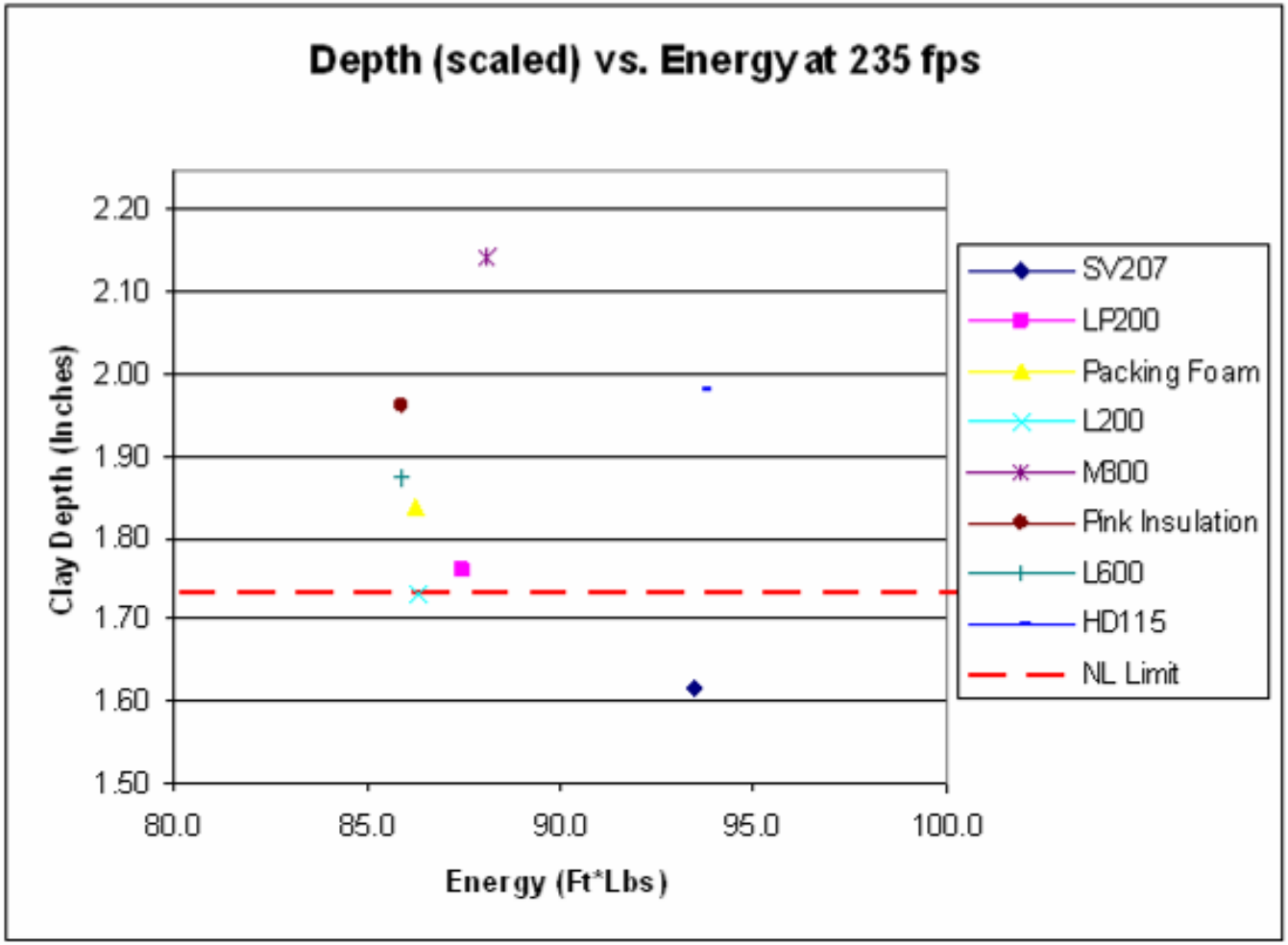
Pressure distribution at 5 degrees of yaw



MSI's pneumatic launcher system

Impact Depth of Various Materials

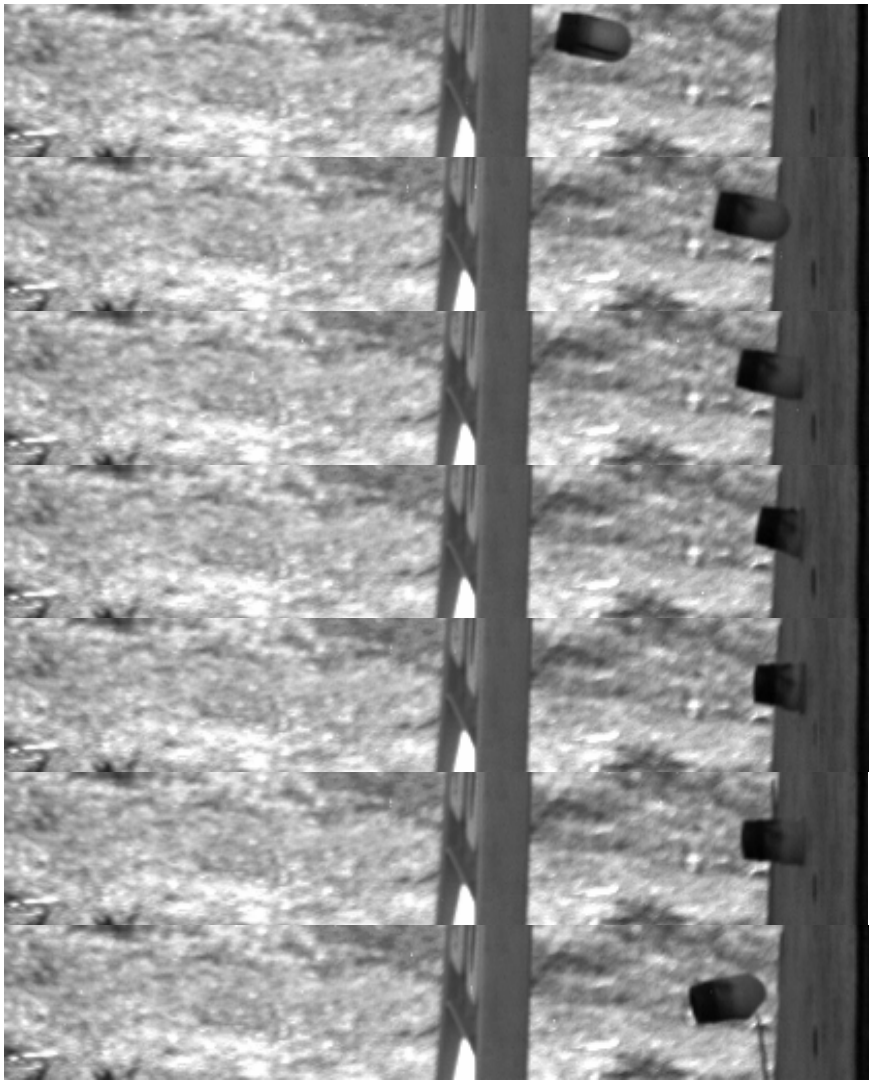
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Performance comparison of various foams for ballistic clay testing

40 mm Less-Lethal Round

Mechanical Solutions, Inc.
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Impact images taken with MSI's High Speed Camera

Projectile impacting ¾" plywood located 75 meters down range at 200 fps

50 Meter Dispersion Test

Mechanical Solutions, Inc.
Engineering Analysis, Test & Technology

10 rounds from a solid mount:

- ***QE of 51 mils***
- ***100% of impacts were within an E-silhouette outline***
  - Approx. 12” horizontal spread and 30” vertical spread
- ***Muzzle velocity standard deviation = 8.00 ft/s***

Impact Velocity at 50 meters	
Avg. Vel. (fps)	**Energy (ft*lbs)**
210.56	78.2

*M1006 at 10 meters has 67 ft*lbs of energy



75 Meter Dispersion Test

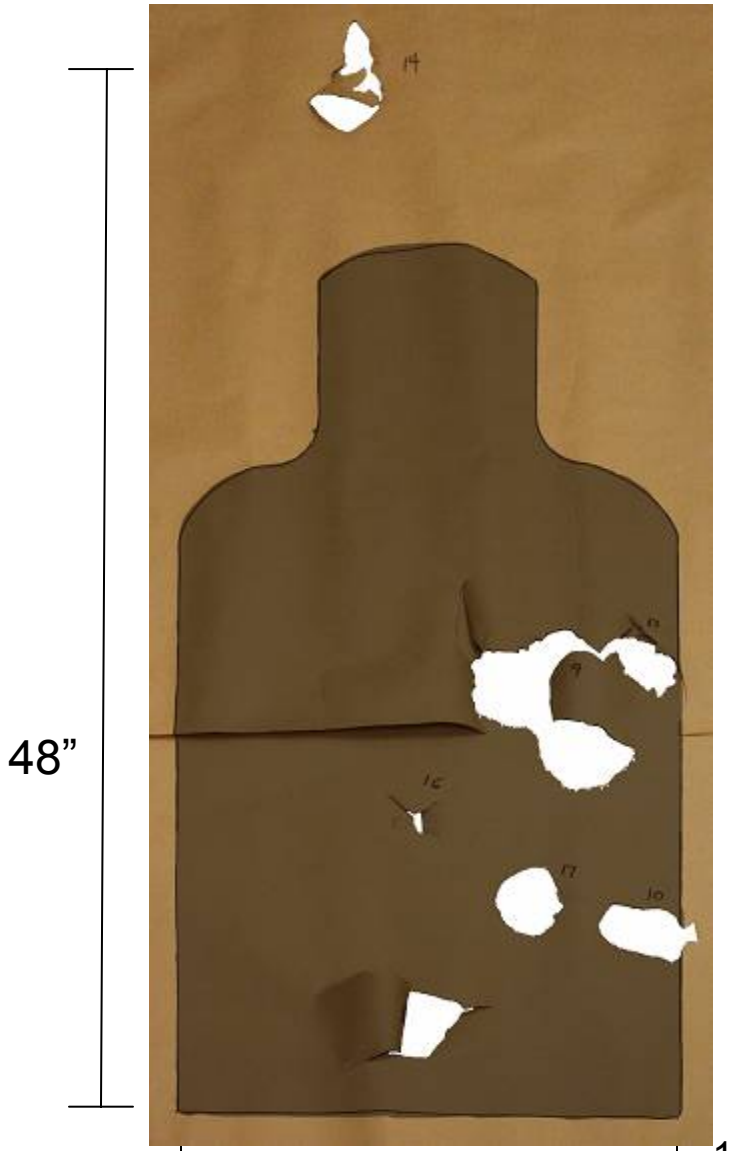
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10 rounds from a solid mount:

- ***QE of 80 mils***
- ***90% of impacts were within an E-silhouette outline***
  - Approx. 12” horizontal spread and 48” vertical spread
- ***Muzzle velocity standard deviation = 6.15 ft/s***

Impact Velocity at 75 meters	
Avg. Vel. (fps)	**Energy (ft*lbs)**
180.33	57.4

*M1006 at 10 meters has 67 ft*lbs of energy



Ballistic Clay Testing

Mechanical Solutions, Inc.
Engineering Analysis, Test & Technology

Clay was tested to meet NIJ specifications prior to firing

- ***Target set-up at 10 meters***
- ***Predicted values based on MSI lab testing were 1.575" with muzzle velocity 240 fps (within 6.5% of actual results)***

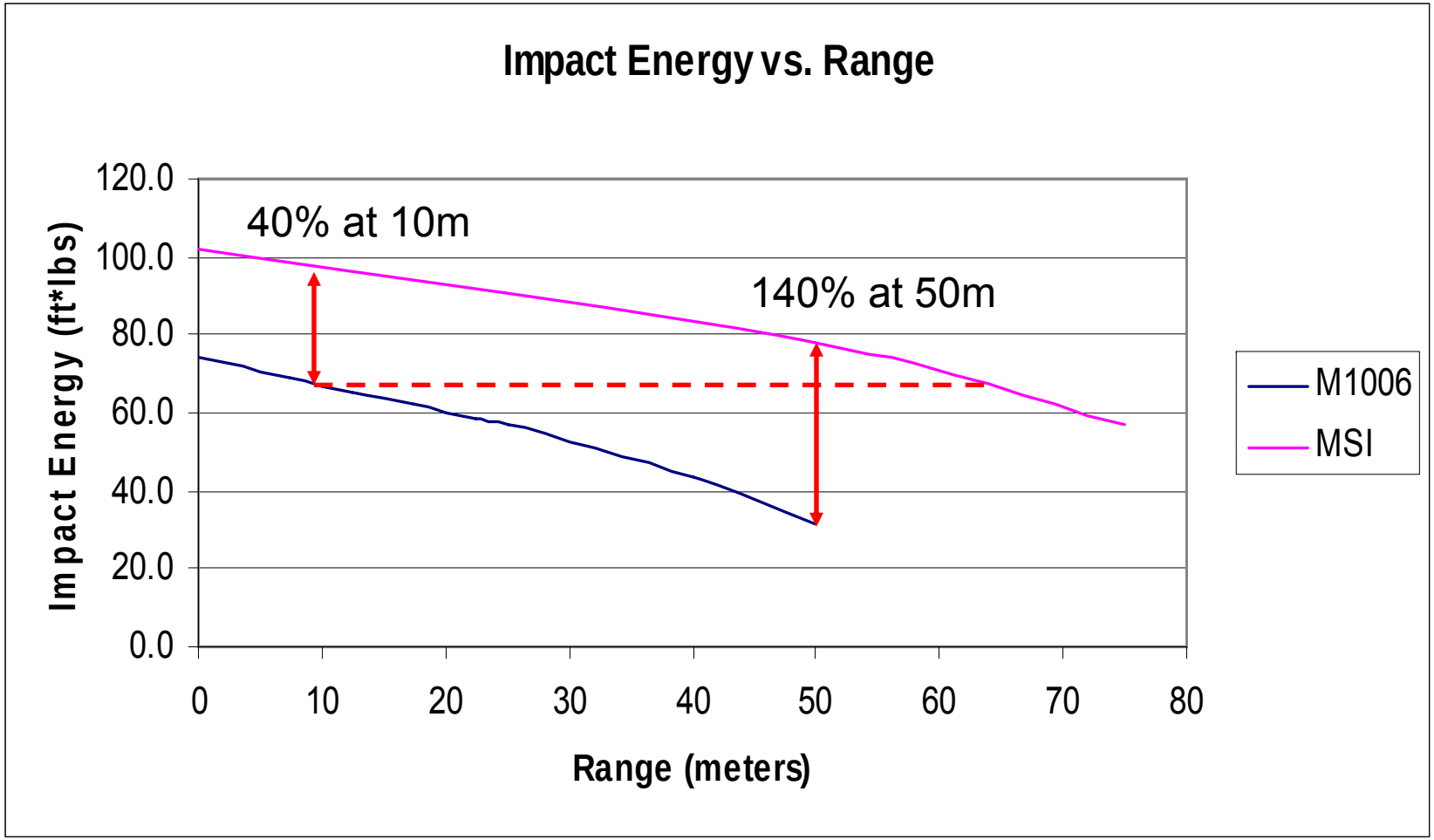
Averages based on 5 shots	Muzzle Vel. (fps)	Depth (inch)	Diameter (inch)	Muzzle Energy (ft*lbs)	% Away from Limit (1.732" NL Limit)
	238.8	1.685	2.28	100.8	-2.74%





Impact Energy vs. Range

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MSI's projectile has higher initial impact energy and maintains velocity downrange

MSI's 40 mm Non-lethal Summary

Mechanical Solutions, Inc.
Engineering Analysis, Test & Technology

Hit probability on E-silhouette exceeded goals:

- ***100% at 50 meters***
- ***90% at 75 meters***

Ballistic clay test showed non-lethality even with more energy:

- ***Delivers over 40% more impact energy at 10 meters than current M1006 while remaining non-lethal***
- ***Maintains velocity downrange better than current M1006 – approximately 140% more impact energy at 50 meters***

Projectile reliability during 38 test shots:

- ***Velocity standard deviation of 12.1 fps (8.1 with no outliers)***
- ***None of the projectiles exhibited instability (barrel does not need to be cleaned)***
- ***Minimal horizontal dispersion even at 75 meters***

INNOVATIVE WALL PENETRATION MUNITION

Keith Olasin, PI

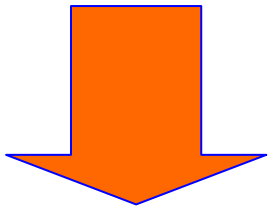
CHALLENGE: ACCESS EMPLACED ENEMY IN URBAN ENVIRONMENT

Problems with structure window & door access:

Conventional = anticipated

Booby-trapped / shielded

Defended by well-armed enemies



Perforate structure walls quickly = Key MOUT* tool

* - Military Operations on Urban Terrain

"Wall Penetrator" Desirable Features -

- Reduce soldier's exposure
- Mobility
- Minimize collateral damage
- Cost-effective approach
  - Build on already-familiar platform
  - Avoid type-classification of new weapon
- Consider wall-perforation parameters
  - Mobility (soldiers) vs. attack (materials)

Proposed Solution: Medium-caliber munition

- 40 mm Caliber = Compatible with M203 launcher
- Options: Less-Lethal or Lethal



Operational Capabilities -

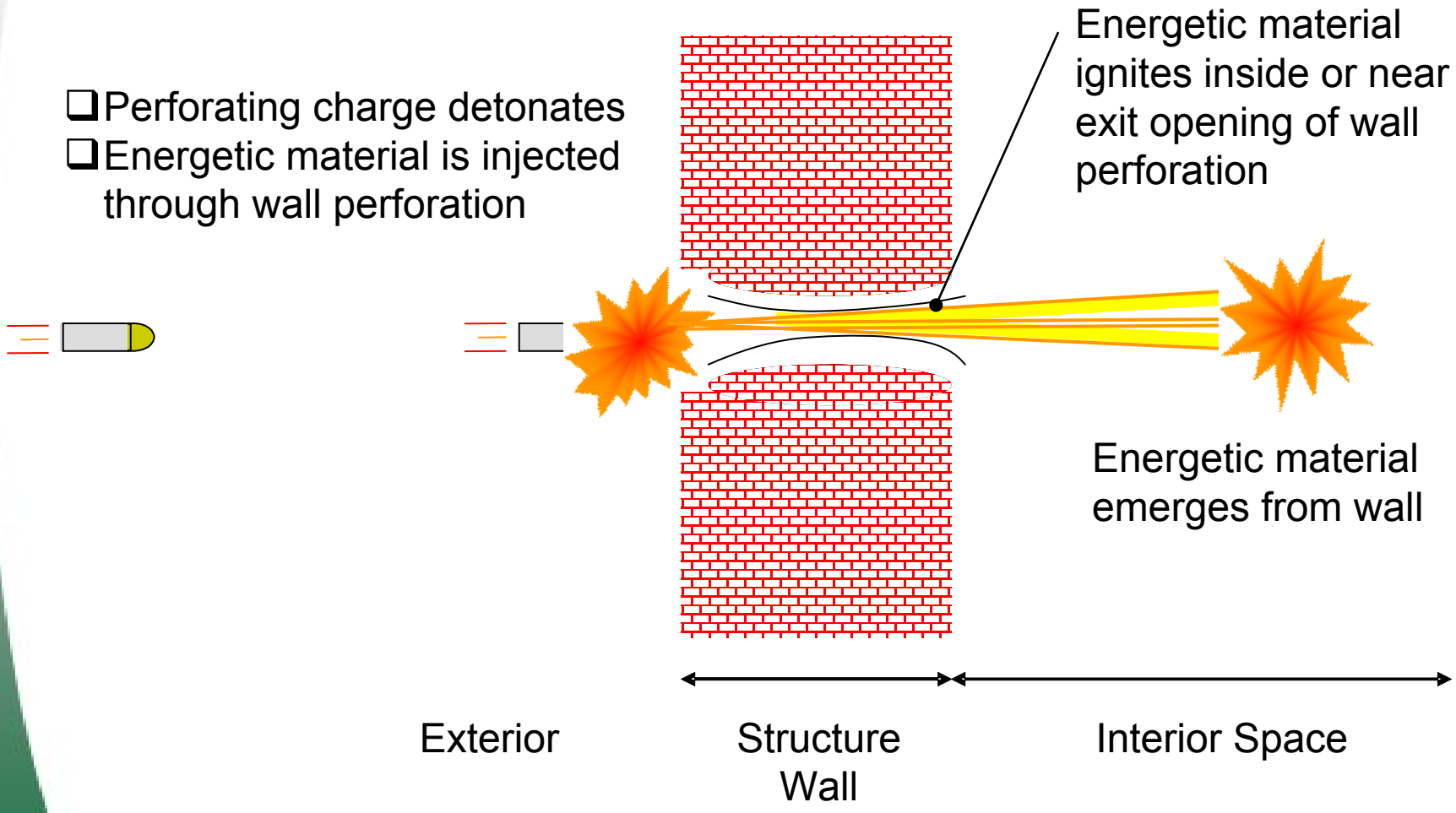
- ***Compatible*** with M203 40mm grenade launchers
  Proven by insertion of full-scale model into weapon
- ***Perforate*** typical concrete structure wall
- ***Deliver*** payload through **concrete wall** to interior space
- ***Adaptable*** - variety of lethal or less-than-lethal future payloads / applications
- Firing accuracy - achieved through spin-stabilization and aeroballistic analysis
- Weight of cartridge approximately 1-lb_m

Innovative Wall Penetration Munition

Mechanical Solutions, Inc.
Engineering Analysis, Test & Technology

CONCEPT 1 – *OPERATION OF THE INNOVATIVE WALL PENETRATION MUNITION*

- Perforating charge detonates
- Energetic material is injected through wall perforation

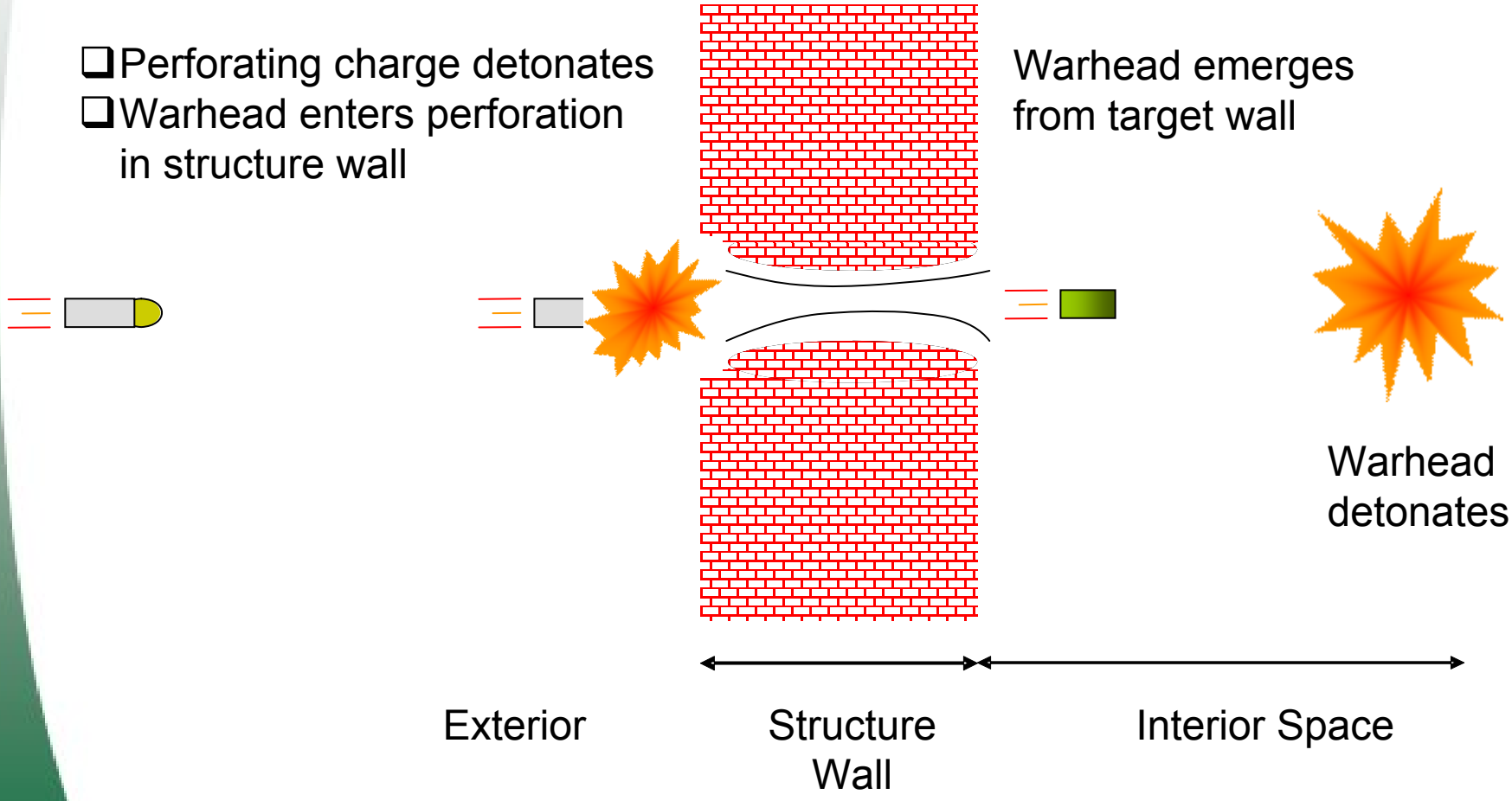


Innovative Wall Penetration Munition

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Engineering Analysis, Test & Technology

CONCEPT 2 -
OPERATION OF THE INNOVATIVE WALL PENETRATION MUNITION

- ❑ Perforating charge detonates
- ❑ Warhead enters perforation in structure wall

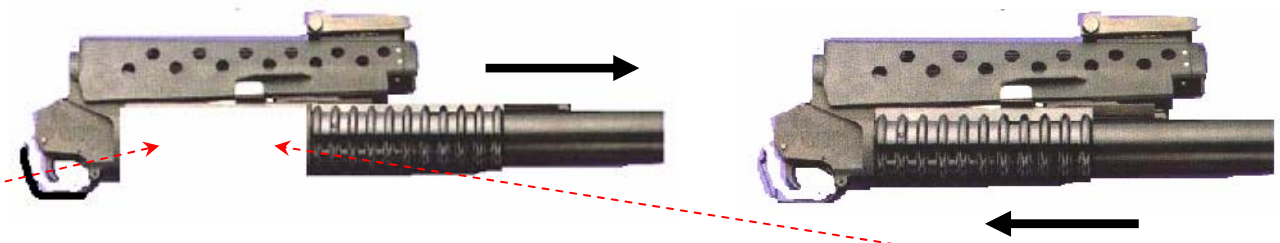


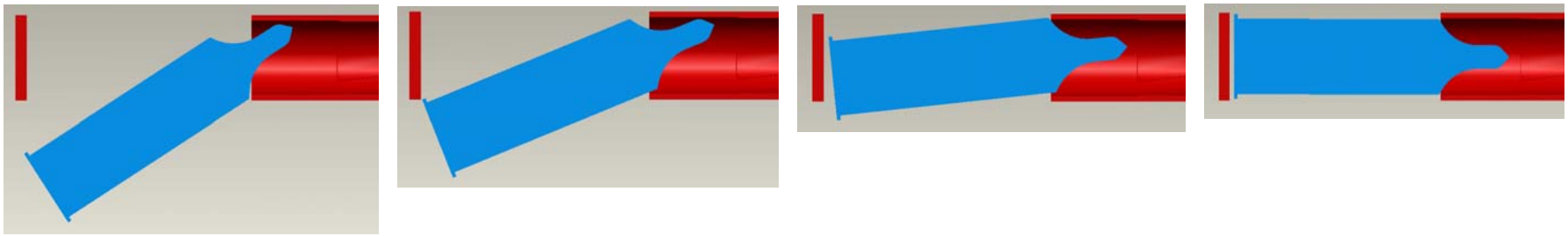
Innovative Wall Penetration Munition

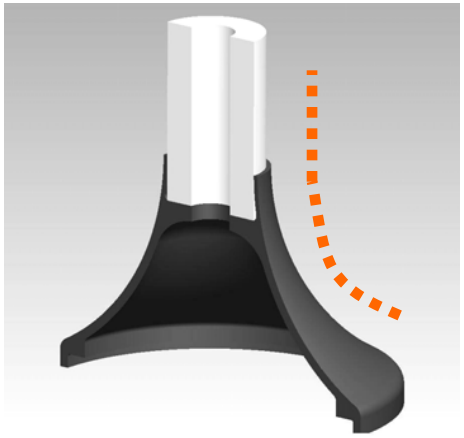
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Engineering Analysis, Test & Technology

MSI's 40 mm INNOVATIVE WALL PENETRATION MUNITION HAS BEEN DESIGNED TO BE FIRED FROM ANY STANDARD M203 LAUNCHER:

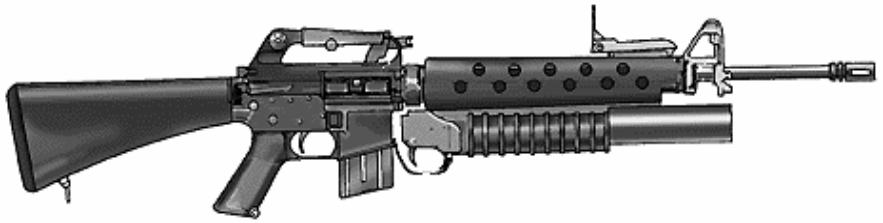
TO LOAD THE M203, A BREECH LOADING WEAPON, THE BARREL SLIDES FORWARD TO OPEN THE FIRING CHAMBER







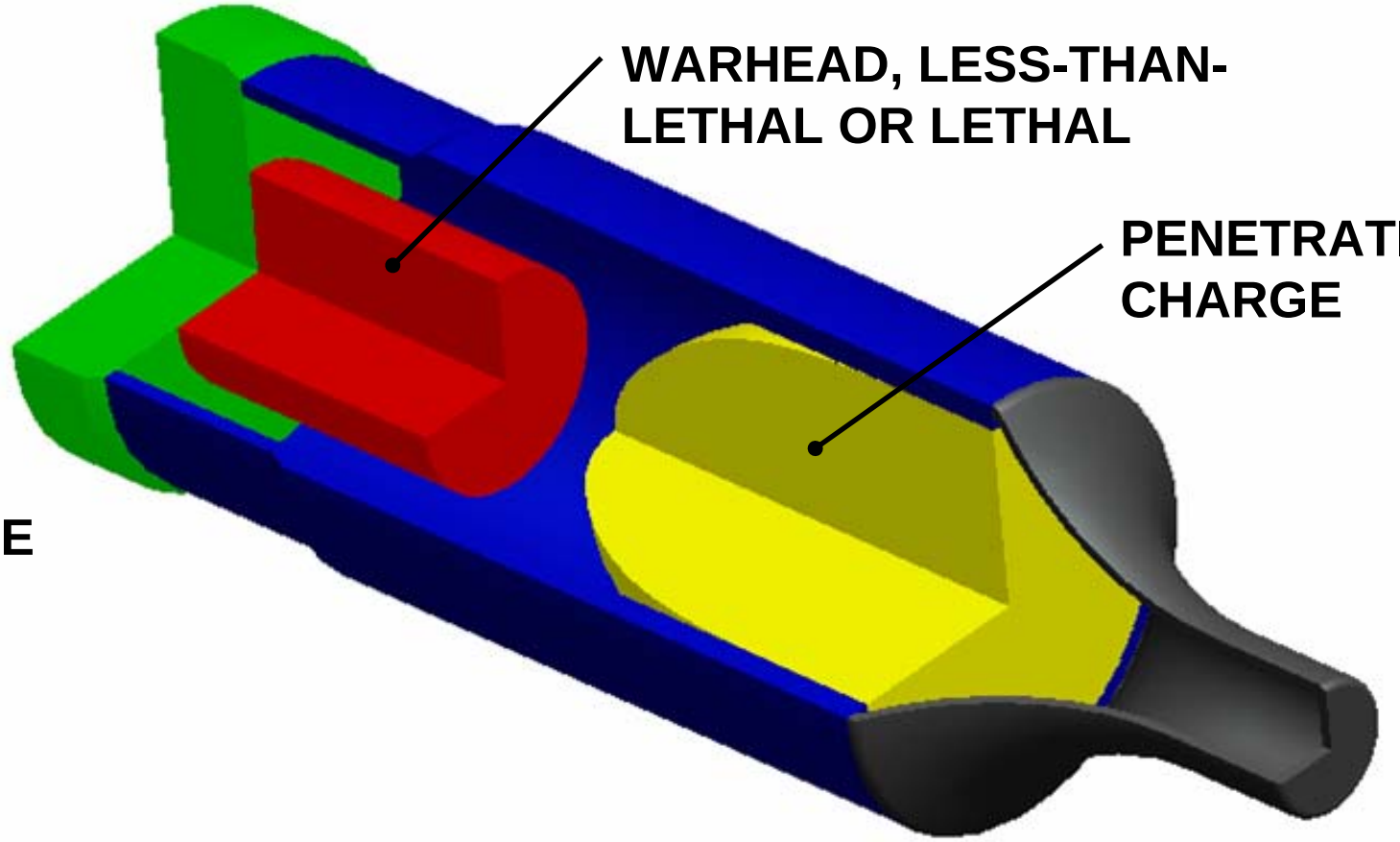
MSI'S UNIQUELY CONTOURED **WINDSHIELD DESIGN** IS THE KEY TO THE 40 mm ROUND'S COMPATIBILITY WITH THE M203 LAUNCHER



Innovative Wall Penetration Munition

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THIS CUTAWAY VIEW DEPICTS KEY COMPONENTS OF MSI's 40 mm ROUND:



Innovative Wall Penetration Munition

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Hardware Design & Testing Progress

- Penetrating charge design ***successful***
  - Consistently perforated concrete targets
  - Holes large enough for follow-through injection
- Charge design ***optimized***, using initial test results & hydrocode analysis
  - Second round of testing scheduled for **May 2007**
  - Hole-formation improvement expected
  - Added flexibility in follow-through munition design





- **Follow-thru**
  - MSI investigating flash-bang concepts
- **Fuze system**
  - Preliminary design complete
  - Evaluating components
  - Potential S&As identified, investigating designs with fuze manufacturers

Innovative Wall Penetration Munition

Mechanical Solutions, Inc.
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U.S. Army SBIR Project – ARDEC, Picatinny Arsenal

Cost and Schedule Summary **-**

Phase I:	40mm Innovative Wall Penetration Munition, $70K / 6 Months, Completed July ’05
Phase I Option:	Warhead Design: $50K / 4 Months, Completed January ’06
Phase II:	Development of Prototype Weapon, $730K / 24 Months, January ’06- January ’08
Phase III Prototype Round (Unfunded)	24-Months Total

List of Current Munition Developments

Mechanical Solutions, Inc.
Engineering Analysis, Test & Technology

- ✪ 40 mm Non-Lethal Round SafeShot™
- ✪ 40 mm Wall Penetrating Round DoubleShot™
- ✪ RPG-Defeat System ShotScreen™
- ✪ 12-Gauge Tagging & Marking Round SafeTag™
- ✪ 12-Gauge Door Breaching Round DoorBuster™

Please Visit MSI's Web Site,
www.MechSol.com

Call / E-mail -

Paul Boyadjis 973-326-9920 Ext.-115 pab@mechsol.com
Keith Olasin 973-326-9920 Ext.-120 kbo@mechsol.com
Eric Olson 973-326-9920 Ext.-125 ejo@mechsol.com

Office of Counterterrorism & Special Missions Operations





Joint Service Small Arms Systems Annual Symposium
7 May 2007

Commander Jim Olive
Commandant (CG-3RPC-1)
Coast Guard Headquarters



Overview

- Handgun Replacement Project
- Re-Cap Goals this Year
- Near Term
- Top Map

Handgun Replacement Project

- **SIGARMS P229R-DAK is Replacing the M9 Beretta.**
  - Approximately 85% of the Coast Guard has transitioned.
- **Type classification – NSWC Crane Division.**
  - .40 caliber (frangible, JHP, & Ball).
  - 5 year Indefinite Delivery/Indefinite Quantity (IDIQ) contract with FEDERAL for JHP & Ball (both 155 grain).
  - Interim Hazard Class assigned (1.4S).
  - Temporary NALC/NIIN assigned.
  - WSESRB TBD.



Re-cap Goals this Year

Over the next year the Coast Guard is going to finish re-capitalization of its handgun, machine gun, and disabling fire weapon inventories. This effort will include the replacement of the:

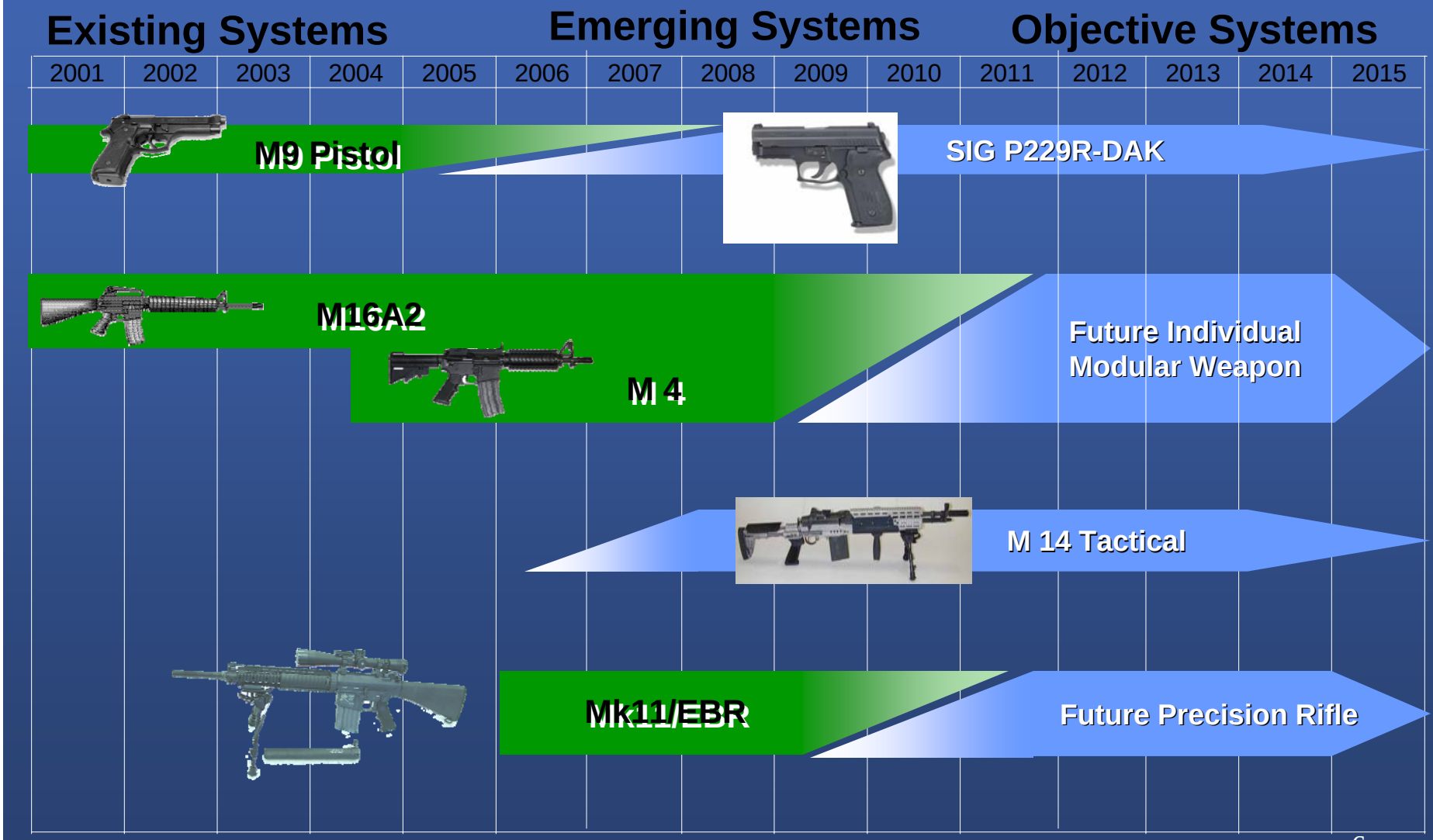
- M9 pistol with the SIGARMS P229R-DAK pistol.
- M60 machine gun with the M240B/H.
- Robar RC-50 .50 caliber rifle with the M107.



Near Term Goals

- The next 2 years will see the Coast Guard continue to refine policy and the supporting Tactics, Techniques, and Procedures for two (02) new weapons initiatives in the inventory:
  - MK11 rifle. The MK11 will be used for precision engagement.
  - M14T rifle. The M14T will be used in support of Airborne Use of Force.
- Currently, there are no near term plans to change the standard service rifle/carbine (M16, M4, MK18), the service shotgun (M870P), or the venerable M2HB machine gun.

CG Small Arms Top Map



CG Small Arms Top Map

Existing Systems | **Emerging Systems** | **Objective Systems**

2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015

RC-50 .50 cal



Payload Rifle

M-107 .50 cal



M 870

M870P Tactical Shotgun



M870 Breaching Shotgun

Future Modular Shotgun



M 60



M 240B & H

Future Individual Modular Weapon



M 2

Future Machine Gun

Questions?

Location & Organization

- Location.

  Commandant (CG-3RPC-1)
  Coast Guard Headquarters
  2100 2nd Street SW, Room 3406
  Washington, DC 20593

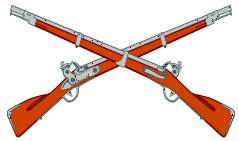
  Phone: (202) 372-2030

- Organization.
  - Office of Counterterrorism & Special Missions Operations.
    - Member of the Joint Service Small Arms Synchronization Team (JSSAST).
  - Organization Staffing.
    - Captain Gary Rasicot (Office Chief).
    - Commander Jim Olive (Division Chief).
    - Chief Warrant Officer John McDaniel (Assistant Small Arms Program Manager).
  - Liaison Positions.
    - Small Arms Repair Facility at NSWC Crane, Indiana.
    - Liaison to the Naval Operational Logistics Support Center (NOLSC) Mechanicsburg, Pennsylvania.



COL Bob Radcliffe
Director, Combat Developments
US Army Infantry Center

Overall Small Arms Strategy



- ***Train the force***
  - Sustain increased frequency and realism of training
  - Resource training, support, and facilities
- ***Sustain the current small arms fleet***
  - Resource, rebuild, and refurbish to sustain the current fleet
  - Procure weapons to fill wartime and transformation needs
  - Product improve existing systems
- ***Modernize the force***
  - Develop next generation of weapon systems and ammunitions
  - Spiral new systems to the force as they become available

Small Arms Strategy

Near Term (2007-2009)

Sustain through refurbish/rebuild, product improve, leverage off-the-shelf technology



Rebuild M249s



Increase M4 Issue



Grenade Launcher Module



Modular Shotgun



1x Close Combat Optic (Rifle)



4x Machine Gun Optic



4x Rifle Combat Optic



PEQ-2

Mid Term (2010-2013)

Modernize by spiraling new systems against key gaps, initiating a common approach



Personal Defense Weapons (PDW)

Future Handgun System (FHS)



Multi-Purpose Sight 1x-4x (Rifle & LMG)



Improved PEQ-2



TWS II

Far Term (beyond 2013)

Integrate new technologies; reduce Soldier load, improve lethality, and improve small unit flexibility



Commonality / Family Concept

Light Weight Small Arms Technology (Caseless/CTA Ammo)

Counter-defilade technologies



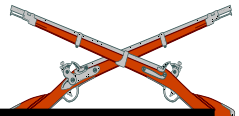
Conceptual Fuzed I2/Thermal Weapon Sight



Day/Night Sight with Fire Control

Strategy Supporting Efforts





Analysis

Studies

Requirements Documents

FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY15+
	Analysis → **Conduct AoA(s)**						
	Capabilities Based Analysis				*CBA consists of:* *-Functional Area Analysis* *-Functional Needs Analysis* *-Functional Solutions Analysis*		
		Rand Commonality Study					
		JSSAP Caliber Study					
		PM MAS Lethality Study					
			CDTE/PDW/FHS iCD, **CDD(s) /CPD(s) Developed**		*Address GAPs in:* *- Lethality* *- Weapon size/weight* *- Defilade target engagement* *- NL incapacitation* *- Limited visibility acquisition* *- Combat ID*		

Develops more lethal and effective future systems based on appropriate analysis and emerging advanced technology

Individual Small Arms Strategy

Near Term (2007-2009)	Mid Term (2010-2013)	Far Term (2014 and beyond)
 M249 SAW	 M249 PIP	
 M4 MWS Sights & Accessories	 Personal Defense Weapons (PDW)	
 M9/M11 Pistol	 Future Handgun System (FHS)	Commonality / Family Concept
 M203		Light Weight Small Arms Technology (Caseless/CTA Ammo)
 12 Ga Pump Shotgun		Counter-defilade technologies
 Grenade Launcher Module		
 Modular Shotgun		

Crew Served SA Strategy

Near Term (2007-2009) ***Mid Term (2010-2013)*** ***Far Term (2014 and beyond)***

M240H



M240B



M2



MK19



M107



M24





Semi-Automatic Sniper Rifle



M240E6



M2A1

Future Crew-Served Weapon Capabilities (Pending Further Analysis)

Small Arms Ammunition Strategy

Near Term (2007-2009)

Increase Warfighter lethality and training capability



Field an improved 5.56mm cartridge



40mm Fleshette cartridge



Close Combat Mission Capability Kit



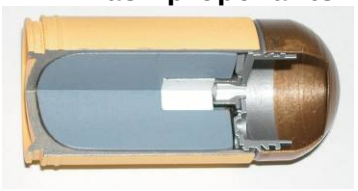
XM1022 .50 sniper

Mid Term (2010-2013)

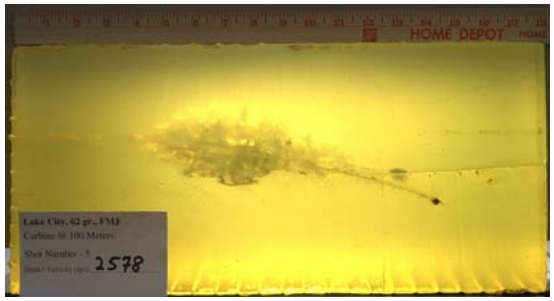
Increase Warfighter survivability and develop predictive tools



Implement reduced flash propellants



40mm Improved Performance Round



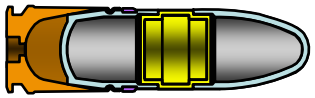
Small Caliber Effectiveness Assessment Program

Far Term (2014-)

Significantly greater effectiveness & lighter weight systems



Potential Alternate Rifle Caliber



Bursting Munitions



Light Weight Technologies

M249 SAW Sustainment Strategy

Proponent:
HQ AMC

Staff lead:
COL Bates,
AMC G3

Staff assist:
DA G3, G4, G8,
TRADOC

Summary: TRADOC identified M249 SAW #1 priority for improvement in 23 Jan 06 AROC.

Background: --Resulted in VCSA tasker to AMC to develop M249 Sustainment Strategy.

--M249 SAW fielded in 1984. Approximately 88,300 in Army use.

-- New weapon production 750/mo; 350/mo overhaul.

-- Soldiers view M249 as a reliable, effective weapon when new/overhauled but current fleet is old and worn out.

353 M249s/ IBCT

--Repair and Return Approved by VSCA on 5 May 06

Repair Options	Features	Cost/wpn	Cost/IBCT
SARET	Unit location. Repairs to 10/20 stds.	$135	$ .05 M
Repair and Return	Bi-weekly pickup and return of assets by depot. Repairs to IROAN standards	$2698	$.9 M
Depot Overhaul	Repairs to full DMWR stds. Units turn in assets. Two month min. RCT.	$3141	$1.1 M
New Production	Produced to new weapon specificiation. Limited by OEM capacity.	$3103	$1.1 M



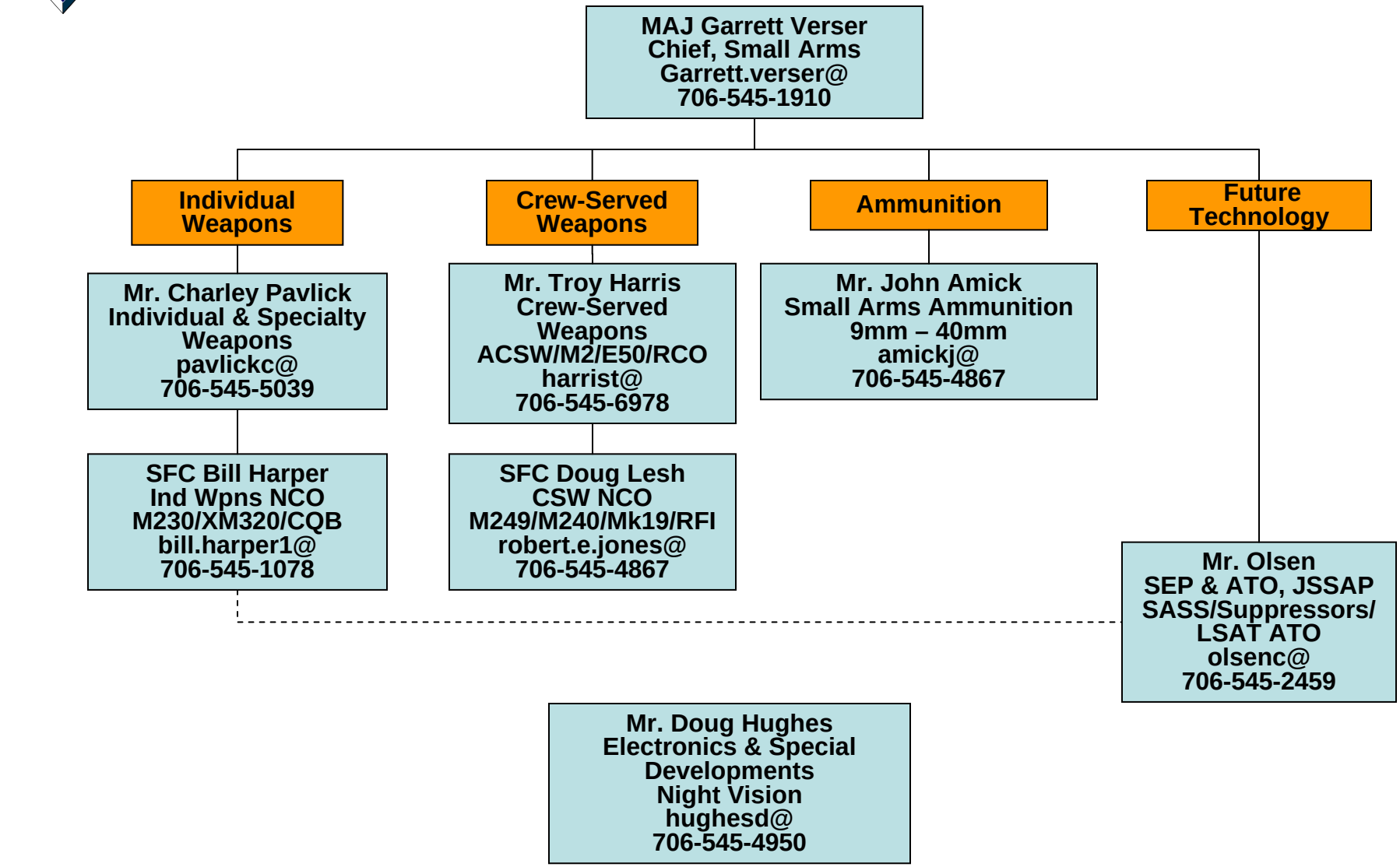
Required Decisions	Recommendations
Repair Option	1. Extend R&R program to all re-deploying units at $1mil per IBCT up to depot capacity of 100 weapons per week. 2. Use SARET to inspect and repair lower priority weapons when exceeding depot capacity.

Risk Analysis/Justification: Need to restore soldier confidence in this weapon.

Areas of Interest

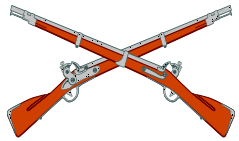
- Reduce Weapons Size, Weight, and increase capability
- Weapon Product Improvement
- Commonality of Parts, Ancillary Equipment, and Ammunitions
- Sound and Flash suppression
- Counter-Defilade Defeat Technologies
- Fire Control, Day, Night, and Fused Optics
- Personal Defense/Offense Weapons

Points of Contact



Email addresses: [name]@conus.army.mil





Backup

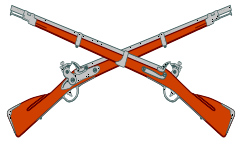
Rand Commonality Study

- **Purpose** Inform Army efforts to develop materiel requirements by assessing the costs, risks, and benefits of developing and fielding common families of systems.

- **Problem**
  - Army and DoD are increasingly developing families of systems: sets of end items built around common platforms.
  - Army has been pushing recent vehicle platforms in this direction based upon expected logistics advantages as well as reduced development and procurement costs.
  - From a military standpoint, platform commonality has the potential to increase risk by sub-optimizing operational capabilities in order to achieve cost savings and improved supportability.
  - Army needs to gain a better understanding of how commonality provides benefits and imposes costs and risks so that it can better determine when to make commonality a key design constraint and how far to take it.

- **Summary** This project will develop lessons for the Army that can be applied when developing materiel requirements and recommend a framework for evaluating the costs, risks, and benefits of commonality in future development efforts, both at the system level and at the component level.

Lethality Study



- **Began:** JAN03-DEC05
- **Organization:** PM-MAS / ARL / ARDEC / JWB IPT
- **Sponsor:** PM-MAS
- **Summary:** A Joint IPT with strong support from science community answered Infantry Center concerns over inconsistent 5.56mm performance in CQB and allegations of better performing rounds available commercially
- **Findings:**
  - There Is No Significant Difference Between M855 And Commercially Available 5.56mm Rounds
  - Shot Placement Far Outweighs The Minor Differences Among Rounds
  - Weapon-bullet Interaction Varies Greatly And Affects CQB Performance
    - **Outweighs Differences In Ammunition Type**
    - **Causes Variation In Soldier Experience**
  - There Are Techniques That Can Increase 5.56mm Lethality Now
  - Community to develop baseline performance for current systems, and develop predictive analysis tools as the next step.

JSSAP Caliber Study

- **Began:** July 2006
- **Organization:** ARDEC AMSRD-AAR-AEM-I
- **Sponsor:** Joint Service Small Arms Program (JSSAP)
- **Summary:** The purpose of this study is to determine the tradeoffs associated with increasing the lethality over the current M16 series of rifles and carbines and ultimately the possibility of using a single round of ammunition in the rifle squad. The research effort will be a theoretical study to assess the performance trade space that is associated with various calibers and cartridge designs.
- **Progress:** Multiple key performance areas have been identified and the data from past testing is being assessed to determine trade offs and capabilities.

Small Arms Capabilities Based Assessment

- **Began:** 28 September 06
- **Organization:** USAIC DCD SAD
- **Sponsor:** Joint Services Small Arms Program
- **Summary:** The Small Arms CBA will support the Army Small Arms Strategy, consolidating existing analysis, considering individual, crew-served, and mission specific small arms weapons by 30 Mar 07.
- **Findings:** TBD

Interoperability and Integration of Dismounted Soldier System Weapon Systems

Mr. Mark Richter
Chairman
SCI-178 RTG-043

9 May 2007

Program Manager
Marine Expeditionary Rifle Squad
Marine Corps Systems Command
Quantico, Virginia

Overview

- NATO Research and Technology Organization: formed in 1998; ensures the Alliance has at its disposal the best scientific knowledge and technical capability that member nations are prepared to make commonly available. R&T must be responsive to changing requirements and conditions, long term capability requirements, and new science and technology advancements. See www.rta.nato.int for more info.
- Land Capability Group-1 Weapons and Sensor Sub Group desired to initiate a R&D effort to answer critical weapons subsystem problems for current interoperability issues and long term soldier system interfaces and development issues.
- 11 Countries from LCG-1 teamed together: Canada, Germany, Italy, The Netherlands, Norway, Romania, Slovakia, Spain, Sweden, United Kingdom, and United States (Army and Marine Corps). Submitted a proposal to the NATO RTO Panel which was approved.
- Exploratory Team developed Terms of Reference, Technical Activity Plan, and Plan of Work during 2005. A Task Group was initiated in January 2006 with a completion timeline slated for December 2008.
- Membership in the Task Group requires countries to allocate resources to support the Task Group.
- Task Group meets every 3-4 months.
- Includes live fire events with current and prototype soldier system equipment.

Objectives

- Recommendation for NATO standard Weapons System Interface STANAG.
- Define and Outline Human Systems Integration principles and concepts for future Soldier Weapons Systems.
- Investigate the Power Requirements for future weapon systems and methods of providing or generating power.



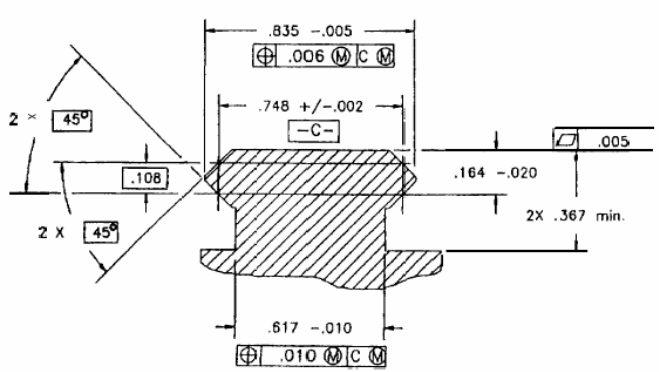
Organization

- The Task Group is led by the Chairman and the Heads of Delegation of the 11 countries.
- Three sub groups
  - Technical Interface Team: Led by Mr. Per Arvidsson from Sweden.
  - Human Factors Team: Led by Major Linda Bossi from Canada.
  - Power Team: Led by Mr. Karl Heinz Rippert from Germany.
- All three Teams have to work together because of overlap in various areas.
- Completion of tasks: NLT December 2008

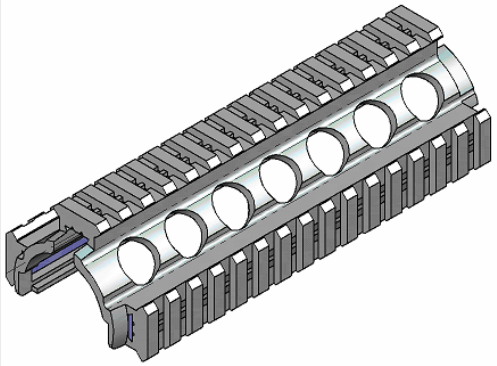
Weapon Rail History



Desert Storm 1991: Clamping and duct tape…



1995 US MIL-STD-1913



2010 Powered STANAG-rail

Current available rails

- CAN C7/C8 ”Weaver”
- DEU G36 Dovetail
- 3/8” Match Dovetail
- GBR AI L96/AW Dovetail
- GRB SUSAT Dovetail
- NATO STANAG 2324
- USA MIL-STD 1913 ”Picatinny”
- USA XM8 PCAP



Weaver/Picatinny



AI L96/AW
11.43 x 2.64 - 60°



SUSAT
19.10 x 5.0 - 60°

Requirements for future rail

- Straightness
- Repeatability
- Zero retention
- Power supply
- Data transfer
- Physical characteristics
- Environmental resistance

Definitions

- **Straightness**: It shall be possible for the user to move the aiming device from its rearmost position to its foremost position on the rail without losing his zero.
- **Repeatability**: It shall be possible for the user to remove the aiming device and put it back again without losing his zero.
- **Zero retention**: The aiming device on the user's weapon shall maintain its zero even after extensive firing.

TI Team Main Road Map

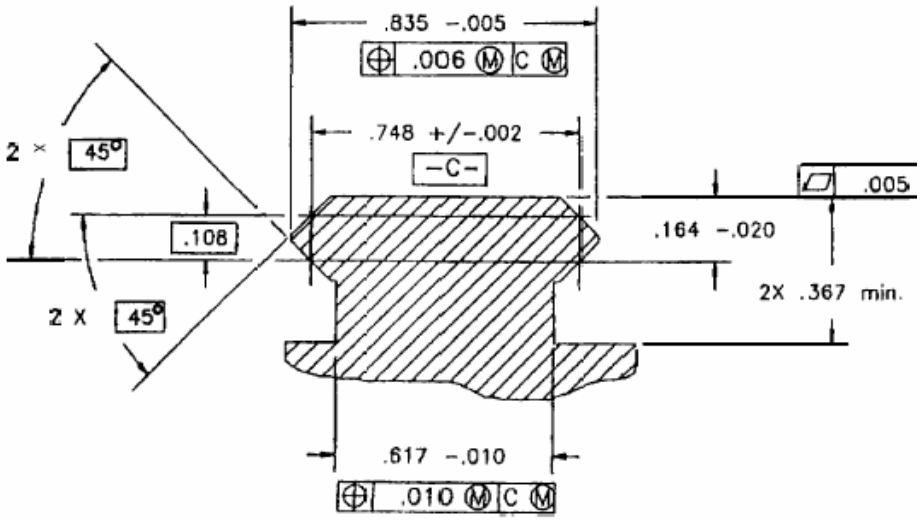
- Even through there are many different rails available today, the team has decided that the MIL-STD-1913 rail is the main alternative.
- It may not be the perfect solution, but being the only rail that has yet been standardized, industry has adopted it as ”The Rail”.
- Most sensors are today available with this interface.
- The group has decided to investigate on how this rail and grabbers could be optimized.

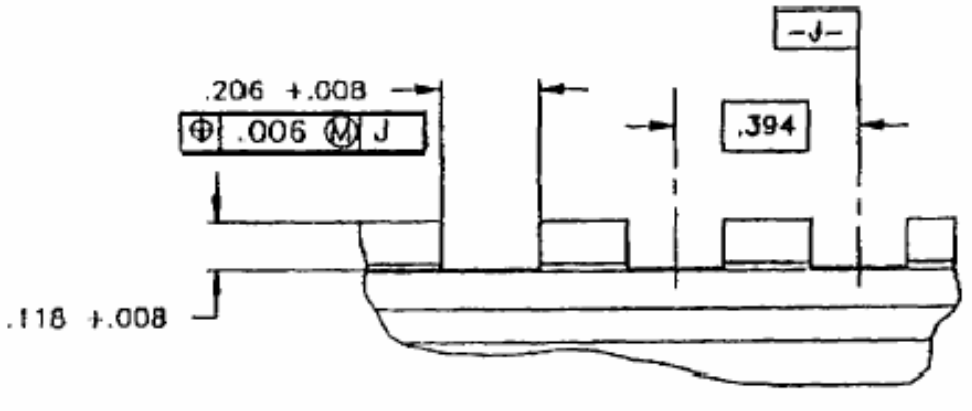
Zero retention, repeatability and straightness

- Draft test protocol. To be finalized at June -07 meeting.
- All to test existing aiming devices, and to report at the June –07 meeting.

Some disadvantages in MIL-STD-1913

- No requirements on repeatability, zero retention or straightness.
- Angles lack measurements and tolerances.
- No tolerances on recoil slots.

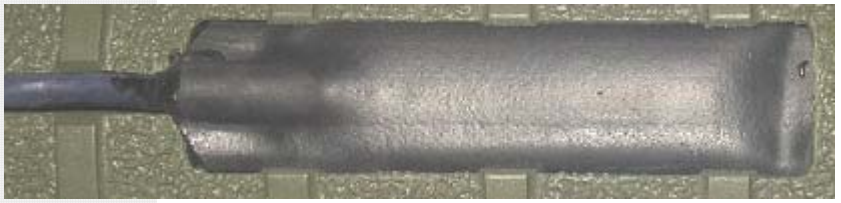




Other possible TI's that could be standardized



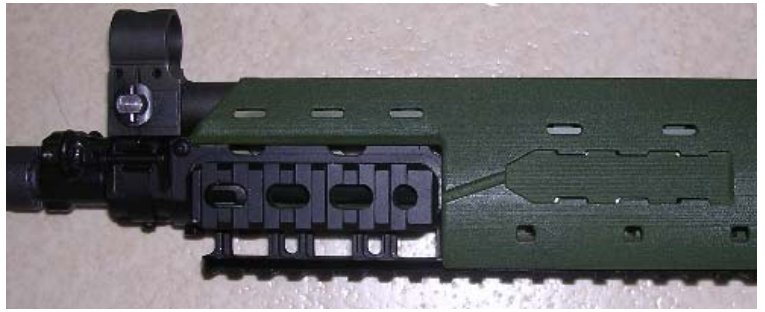




- M16 Magazine
- Pressure Switch
- 22mm Flash hider
- Muzzle Thread
- Bayonet Lug

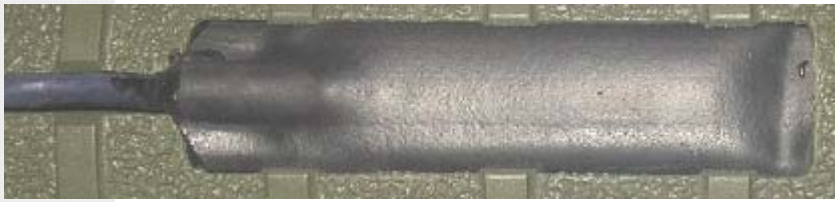


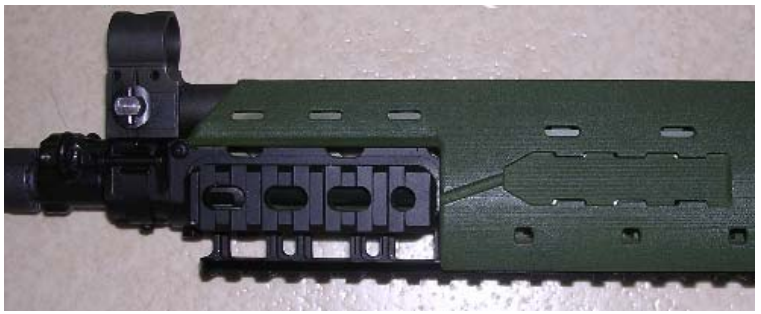




Other TI's to standardize

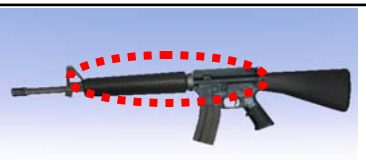
- The team will monitor other technical interfaces.
- It has linked with the Human Factors team and recommended standardization of a pressure switch.





Digital Models

1	M203 Grenade Launcher	
2	Bayonet	
3	C79 Scope	
4	Tactical Flashlight	
5	Holographic Sight	
6	Laser Sight	
7	Tri Rail Mount	

8	AN/PVS-13 Thermal Weapon Sight	
9	AN/PVS-14 I2 Sight	
10	Off-bore Camera	
11	Controls (e.g. Radio)	
12	FCU-HW Fire control for M203	
13	Battery Stock	
14	Butt-stock Magazine Pouch	

Preliminary Model

- Example digital models of rifle and ancillary equipment.

Equipment

1. M203 Grenade Launcher
2. Bayonet
3. Telescopic Scope (Elcan C79)
4. Tactical Flashlight
5. Holographic Sight
6. Laser Sight (e.g. red dot)
7. Tri Rail Mount
8. Off-bore camera
9. Controls (e.g. radio controls)
10. Battery Stock
11. Butt-stock magazine pouch
12. Thermal weapon sights (AN-PVS-13 Medium, Small)
13. I2 (Image Intensification) sight (AN-PVS-14)
14. Fire control unit for M203

Configuration	Equipment	Total Mass
Light	C7A2 only (loaded)	3.53 kg
Medium	C7A2 plus 1,2,3,4	6.45 kg
Heavy	C7A2 plus 1,2,4,7,8,10,11,12, 14	9.68 kg

Light Weight Rifle

Light (3.78 kg): C7 assault rifle, holographic sight,
and 1 loaded (30 round) magazine





Medium Weight Rifle

Medium (6.14 kg): C7 assault rifle, 1 loaded (30 round) magazine, ELCAN C79 Optical Sight, M203 Grenade Launcher, Flashlight, and Laser Aimer







Heavy Weight Rifle

Heavy (8.31 kg): C7 assault rifle, 1 loaded (30 round) magazine, M203 Grenade Launcher, AN/PAS Thermal Weapon Sight, tactical flashlight, and bayonet

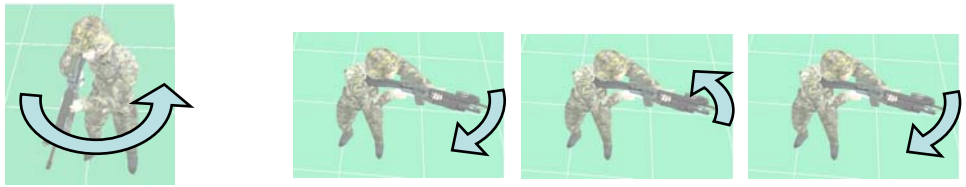


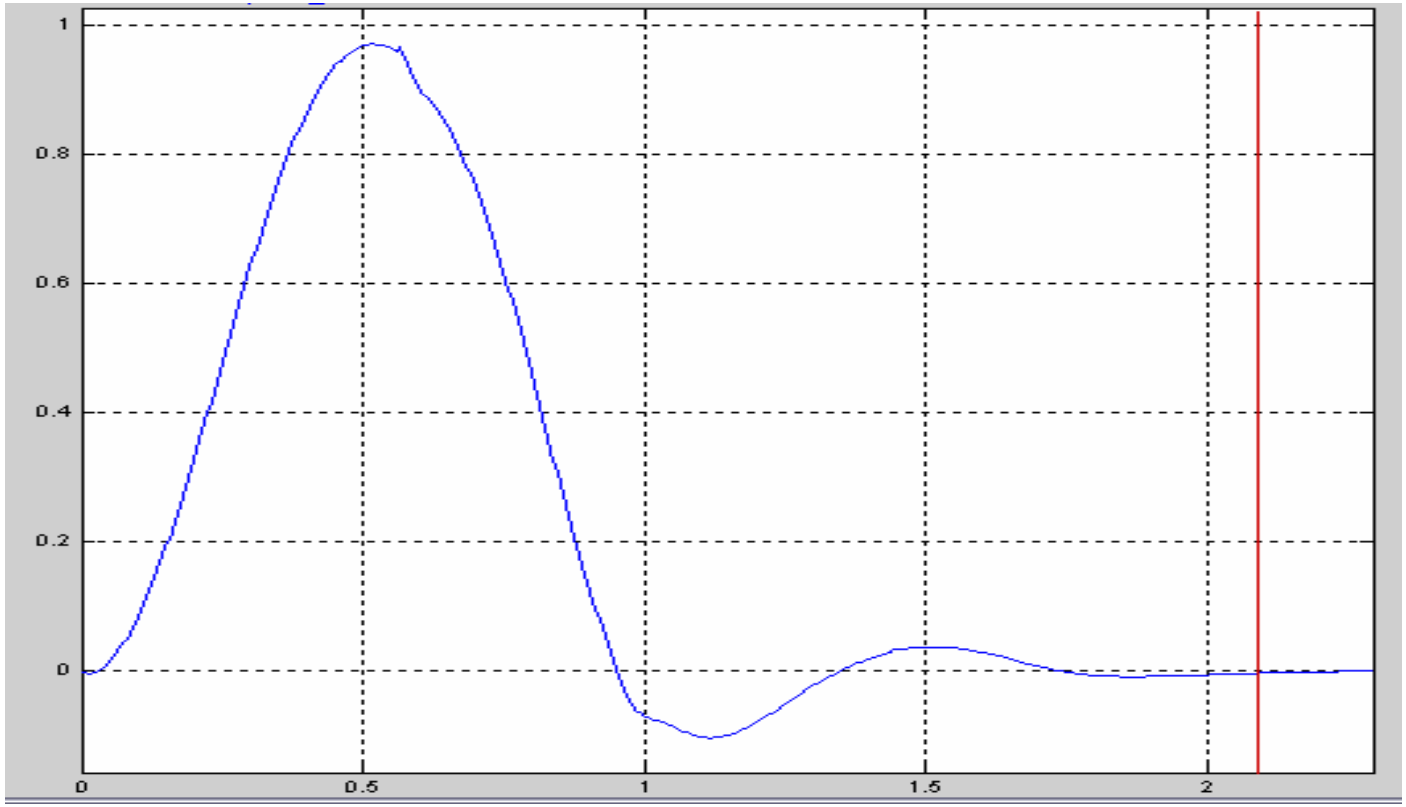


Aiming Simulation



Angular Velocity

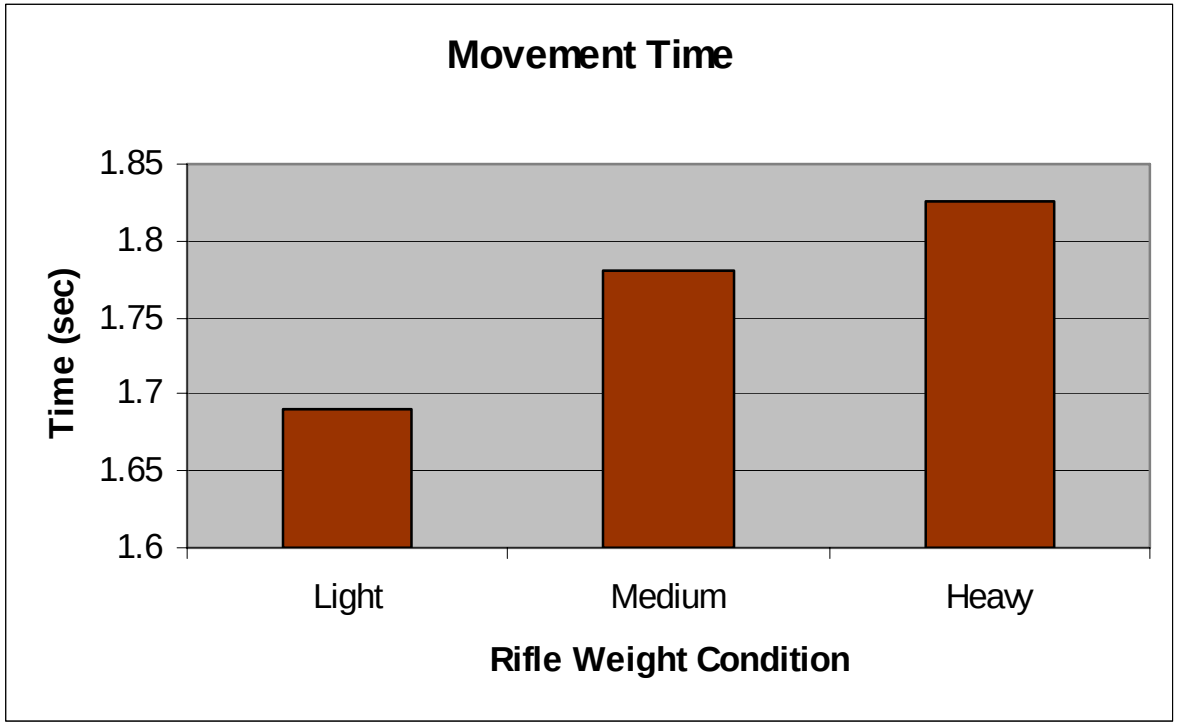




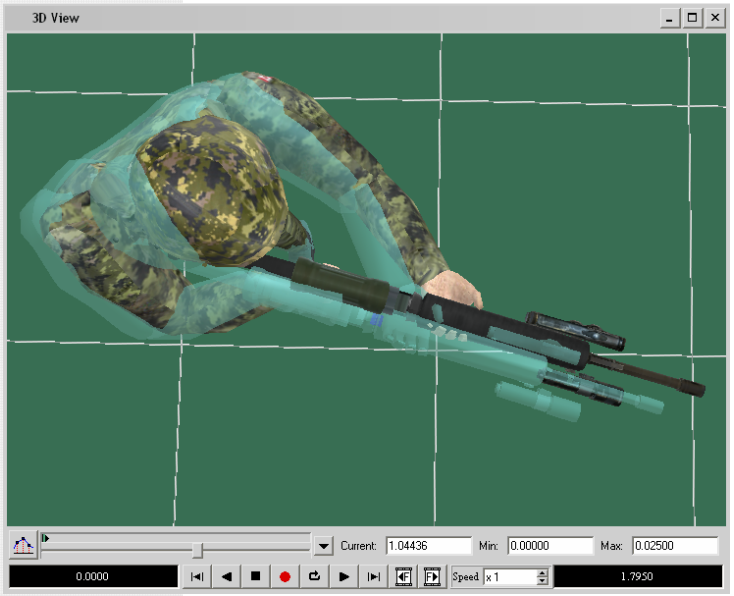
Movement Time

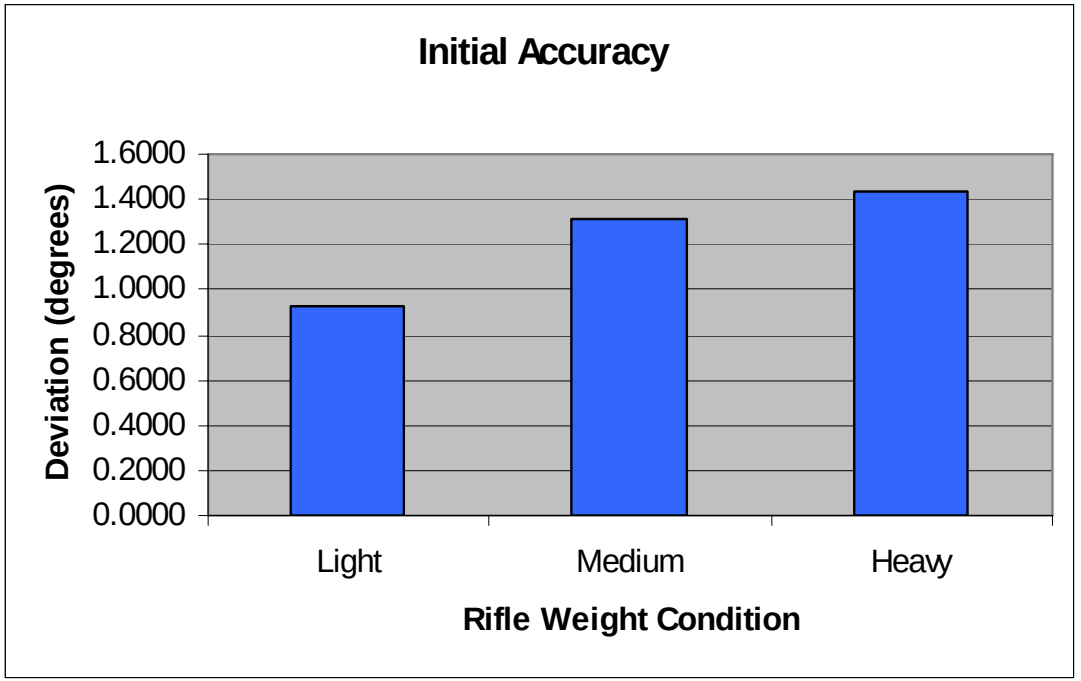




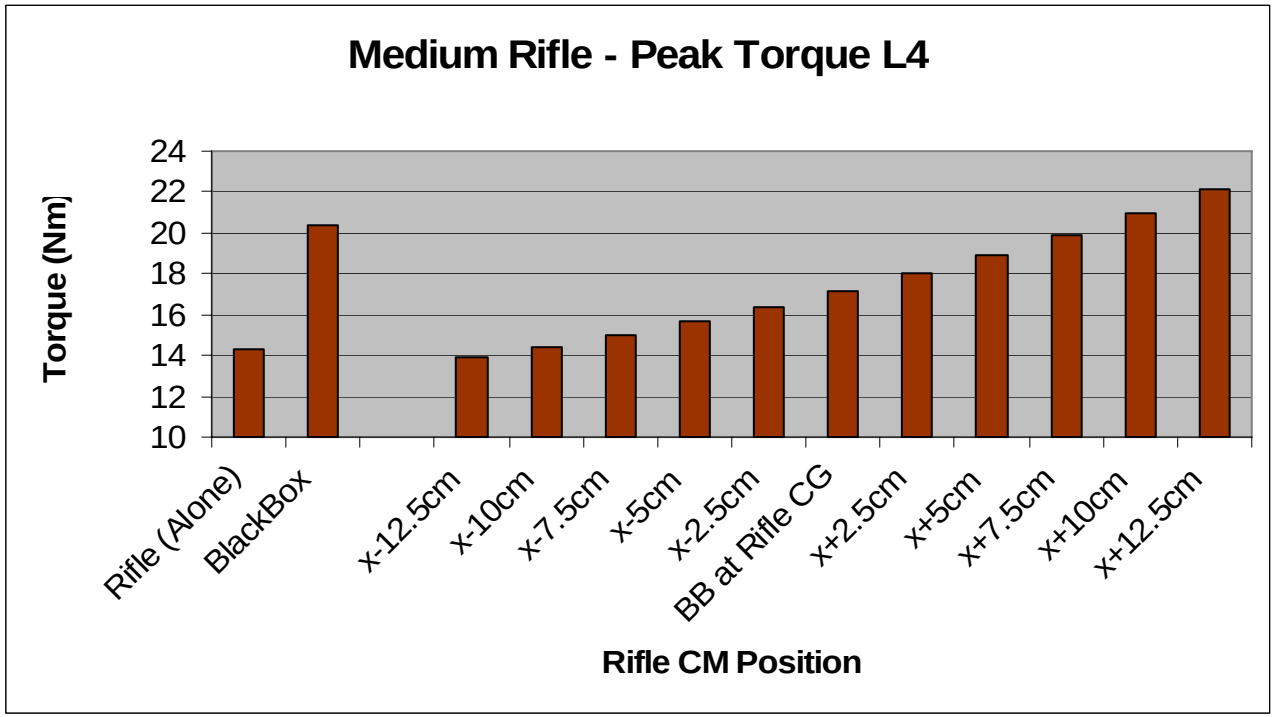


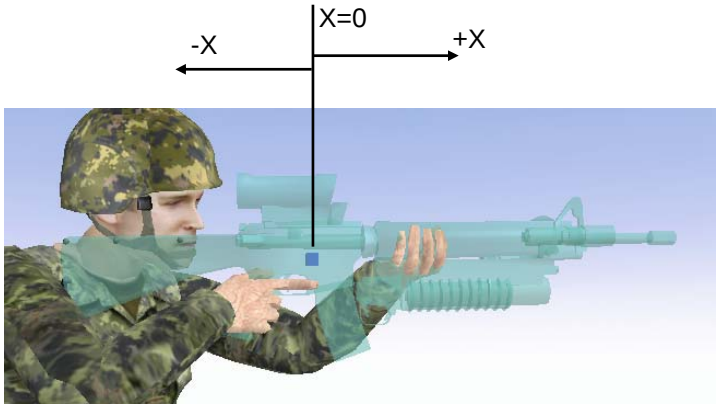
Movement Accuracy



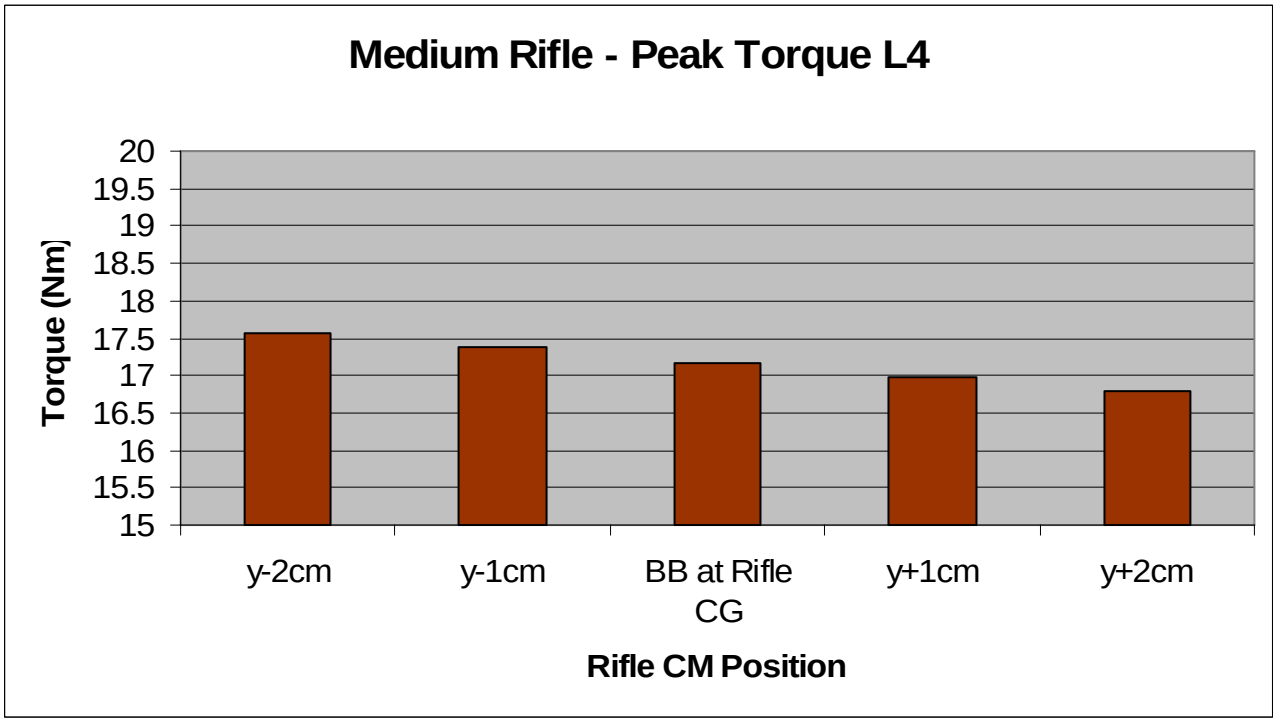


Rifle CoM along X-axis



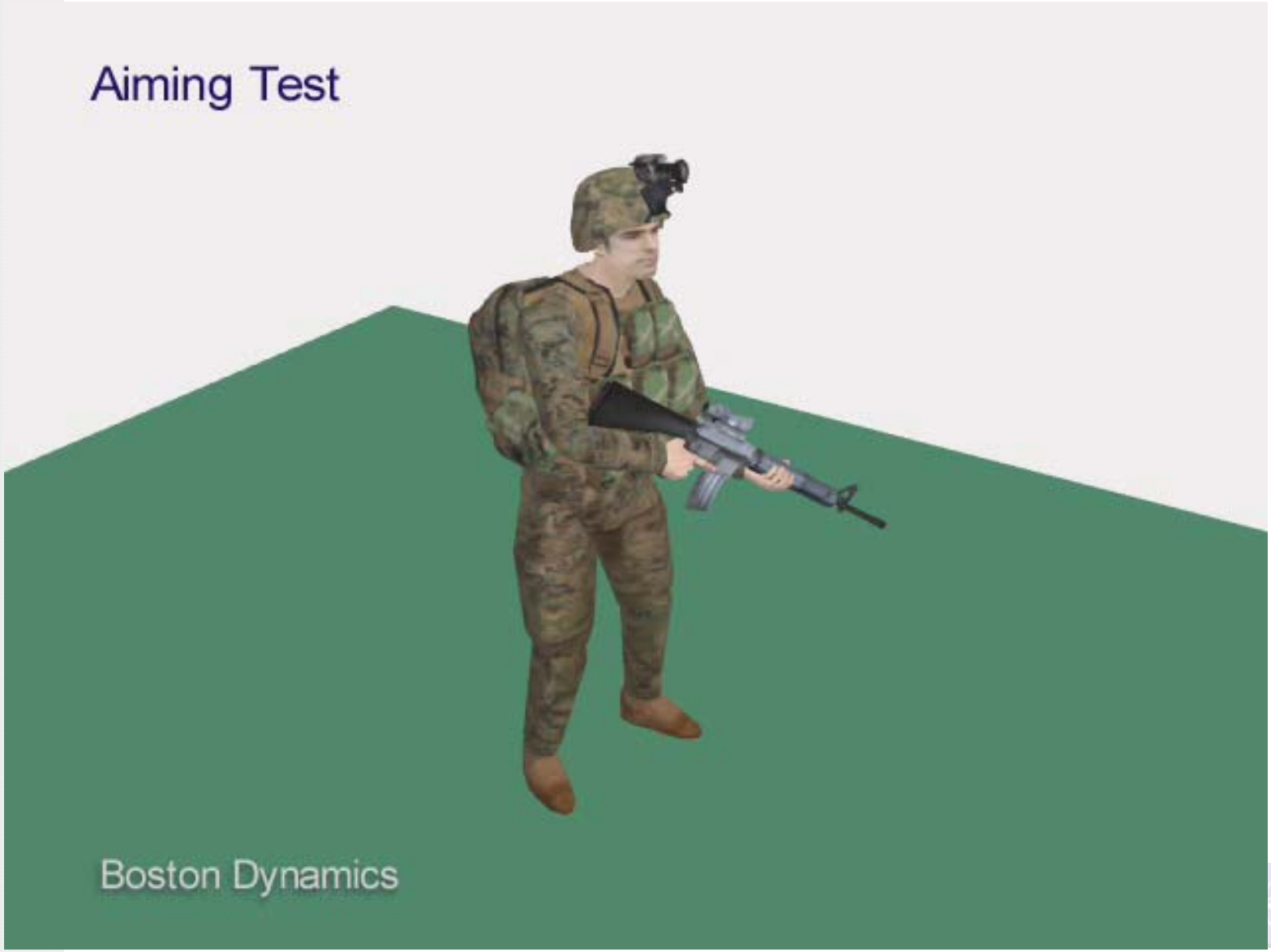


Rifle CoM along Y-axis

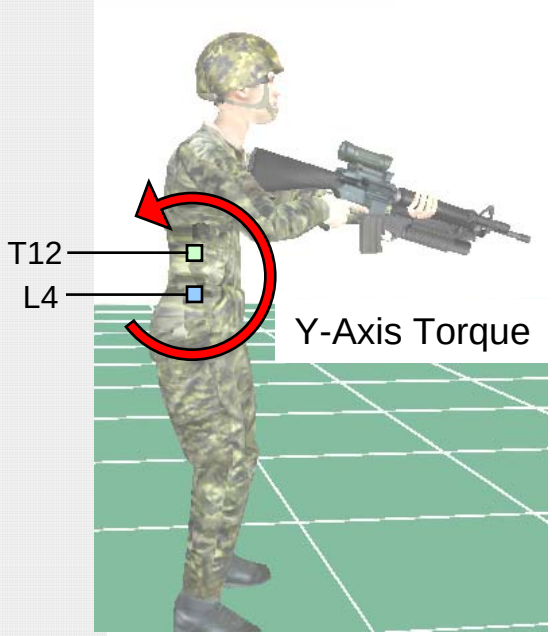


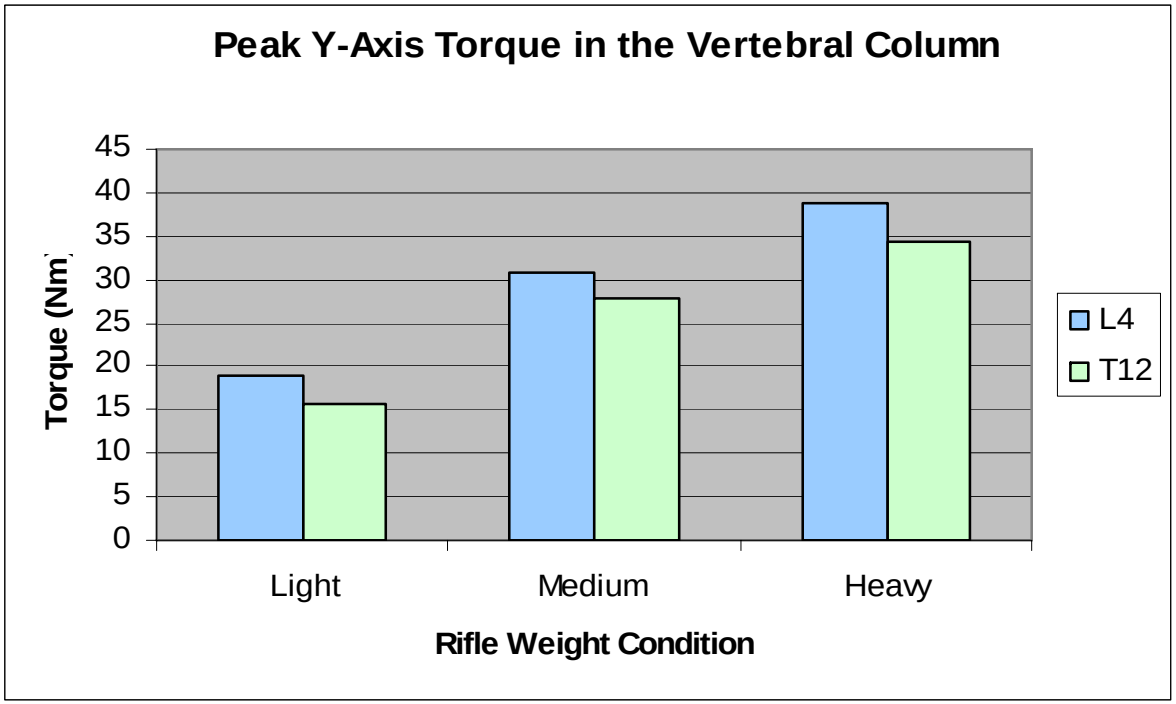


Aiming Simulation



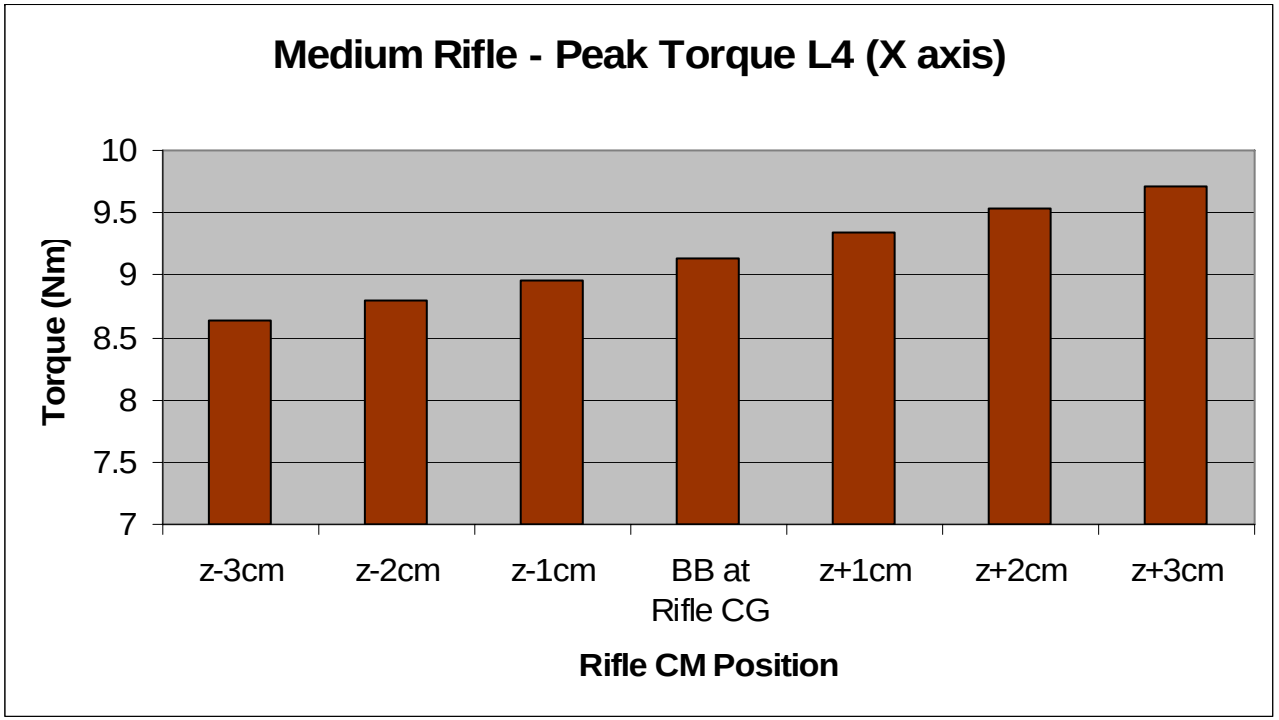
Torque Forces about Y-axis

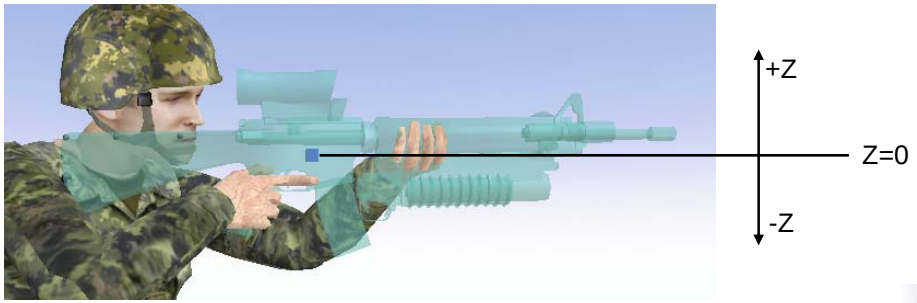




Torque about X-axis







Weapon Sighting

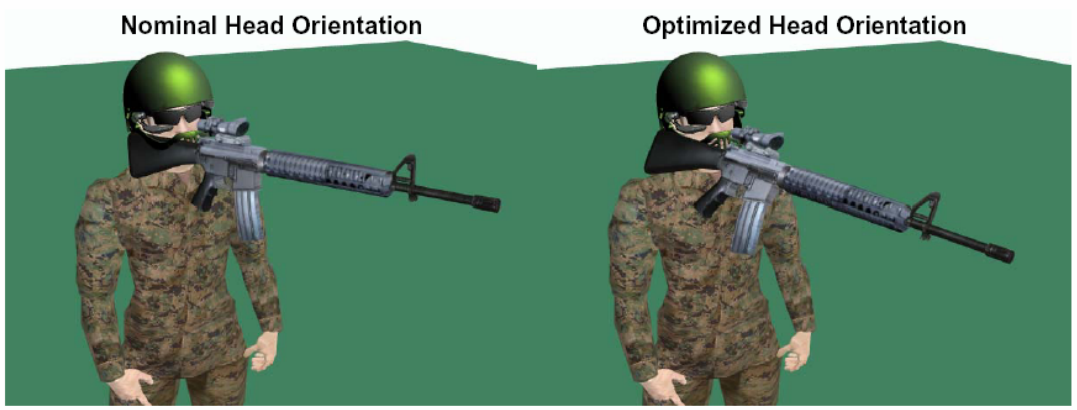
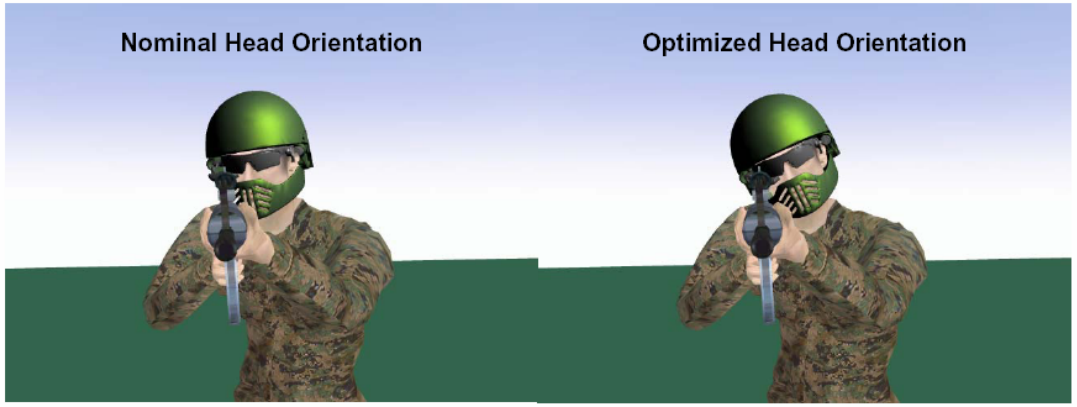


Figure 2-4 Formulating Desired Orientation Euler Angles



Way Ahead

- Conduct more combat weapon simulations.
- Model weapon sighting.
- Develop a live fire weighted weapon test rig.
- Utilize combat experienced NCO's in the test.





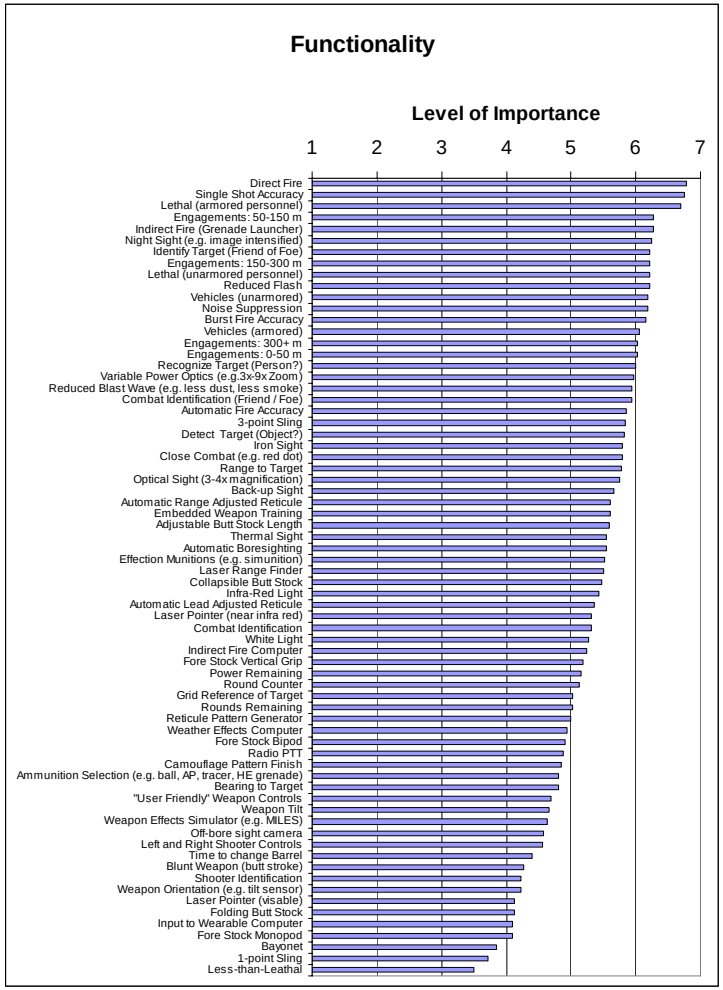
Future Assault Rifle Questionnaire



Priorities for Functionality

Higher Priority Functionality:

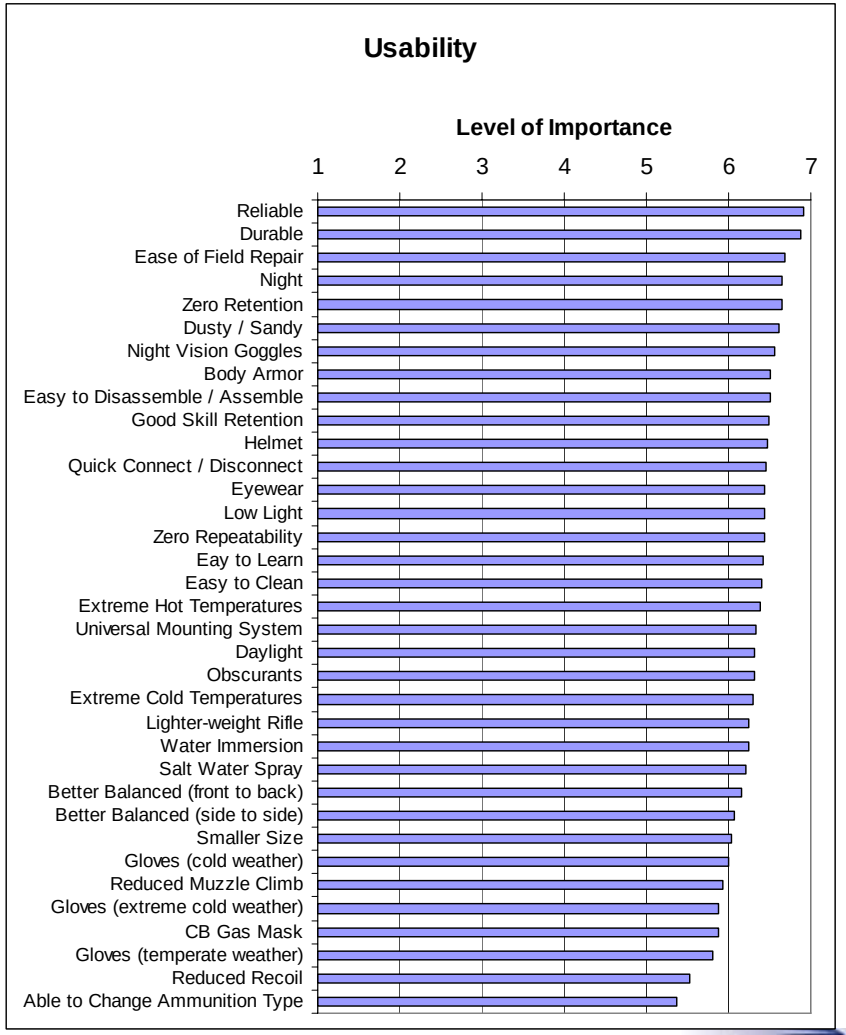
- Single shot accuracy in direct fire.
- Indirect fire capability for lethal engagement of armored and unarmored personnel.
- Night sight with reduced flash and noise suppression.
- Target identification is most important followed by target recognition, and then detection.
- Engage targets between 50-300m primarily.
- Variable power optics, reduced blast wave during firing, and a combat ID capability.
- Accurate automatic fire.
- Three-point sling, close combat, iron, and optical sights, and ranging to target information.
- Back up sight, automatic range adjusted reticule, embedded weapons training, and adjustable butt stock.
- Laser range finder, thermal sight, automatic boresighting, and effects munitions training.



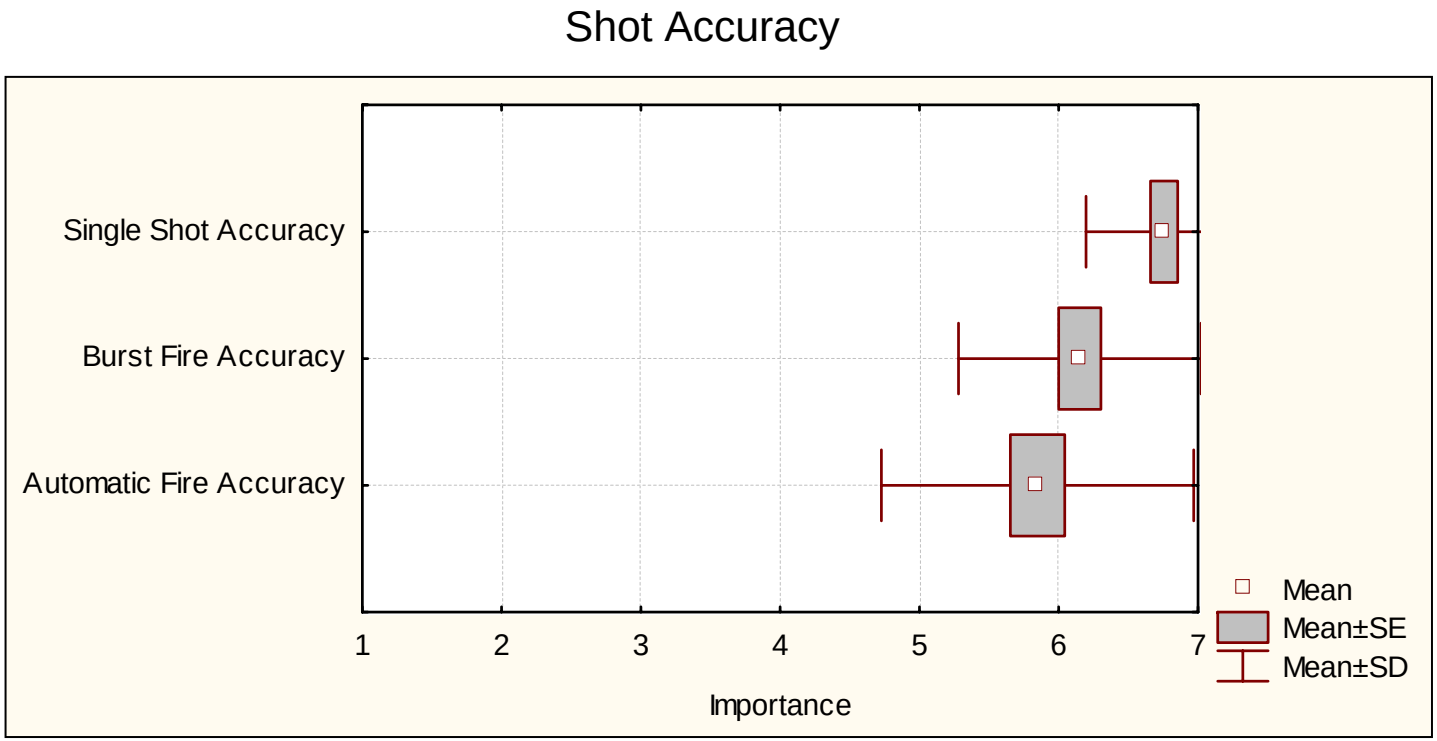
Priorities for Usability

Higher Priority Usability Issues:

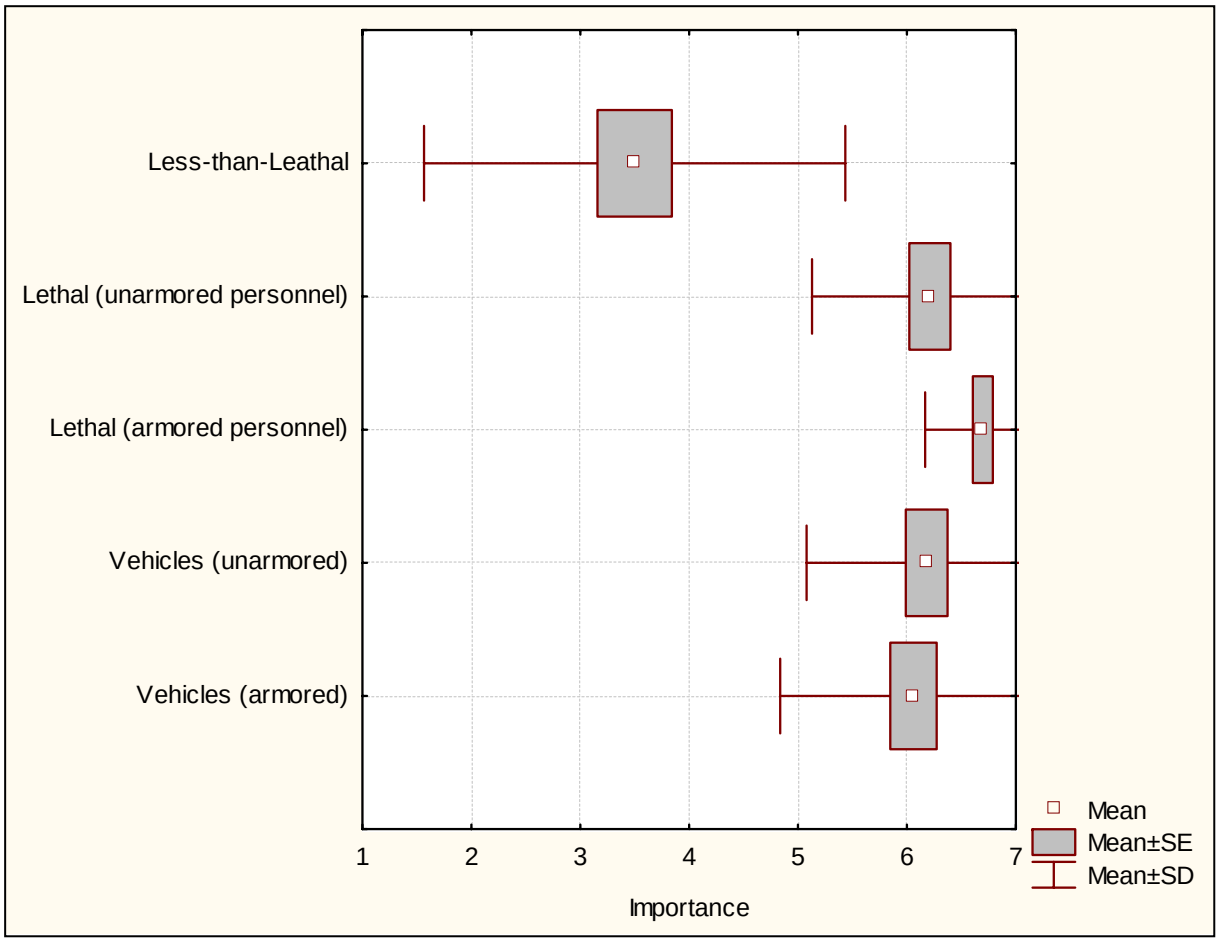
- Reliable, durable, and easy to repair.
- Effective at night and compatible with NVGs.
- Good zero retention, easy to disassemble and assemble, with quick connect/disconnects.
- Compatible with body armor and helmet.
- Good skill retention, easy to learn..
- Zero repeatability, low light use, easy to clean.
- Extreme hot and cold temperatures.
- Universal mount, daylight, and obscured vision.
- Lighter weight, better balance, and small size.
- Water immersion and salt spray.
- Glove compatibility.
- Reduced muzzle climb and recoil.
- CB mask compatibility.



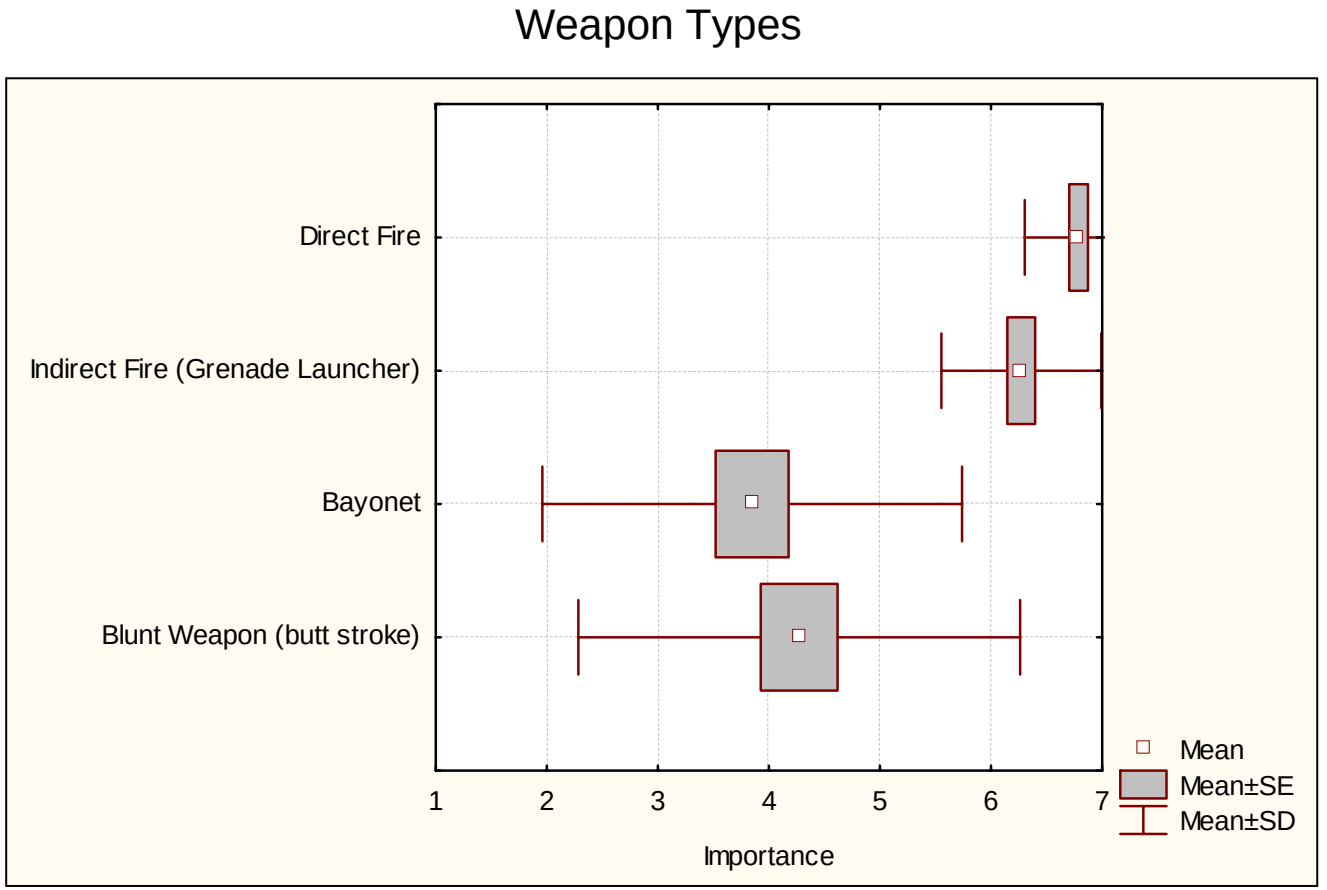
Assault Rifle Capabilities



Assault Rifle Capabilities



Assault Rifle Capabilities



Power Assumptions –

- **1.0 Amp should be sufficient current for power rail**
  - **Issue: Depending on how configured may need to comply to STANAG 4619 – 5 Amps current**
  - **Confirm it conforms to Interface Group thoughts**
- Existing systems to be mounted on future weapons for forward and backward compatibility (will still be needed).
- Charging of the weapon system should be possible via both the soldier system and from the vehicle. Additionally, it is required that the power source may be removed from the system then recharged or replaced. The operation of the weapon including the ancillary equipment must also be possible during recharging.

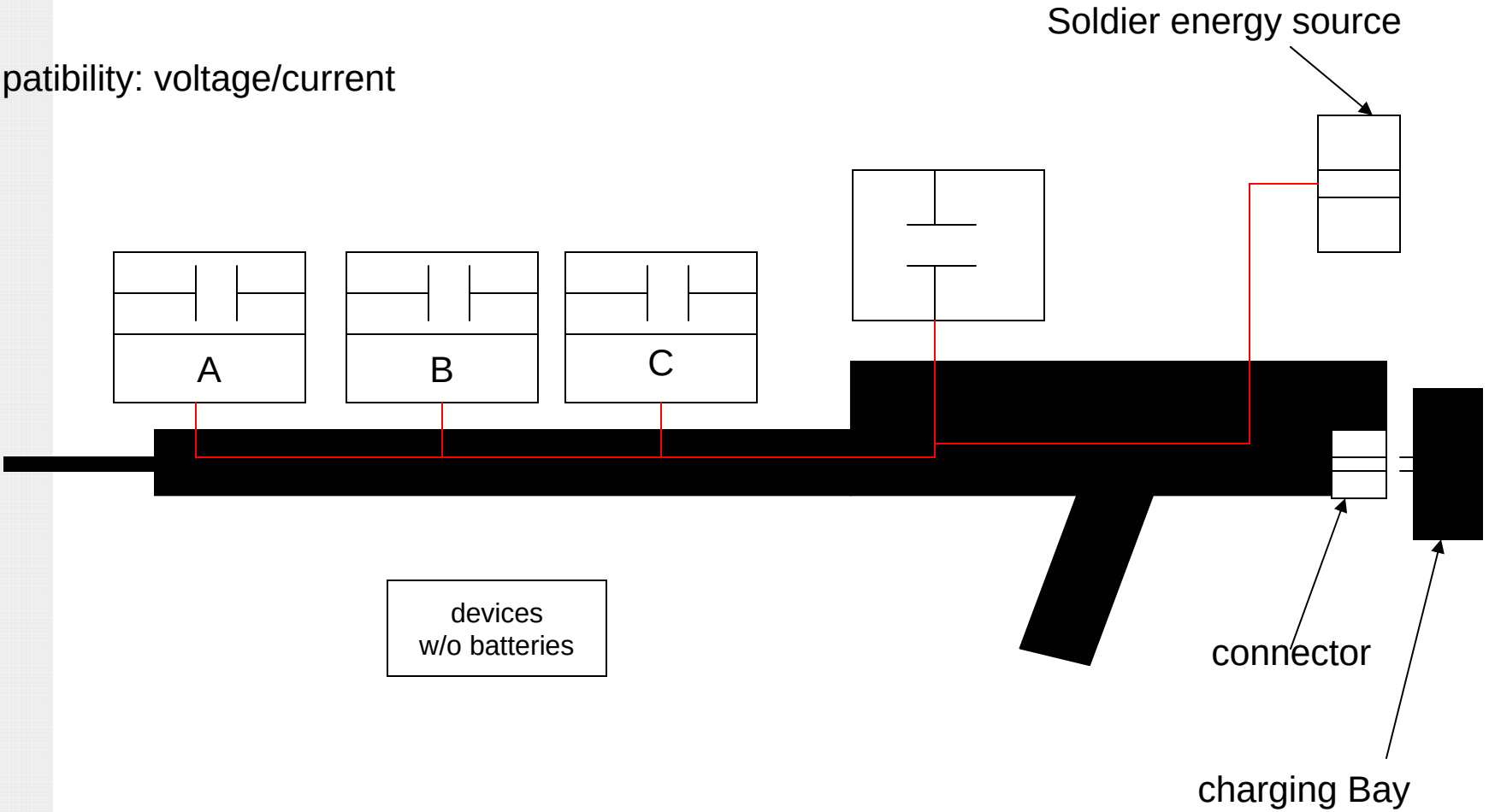
Power Issues

Interoperability and Standardization

- Difficult to standardize on one battery type - "family" of batteries need to be explored (part of report)
- Consult with HF and Interface
  - "maximum" room on weapon (size, weight and location) could be recommended for future weapons concepts
- Common connection to outside – LCG1 has overarching document on C4I architecture

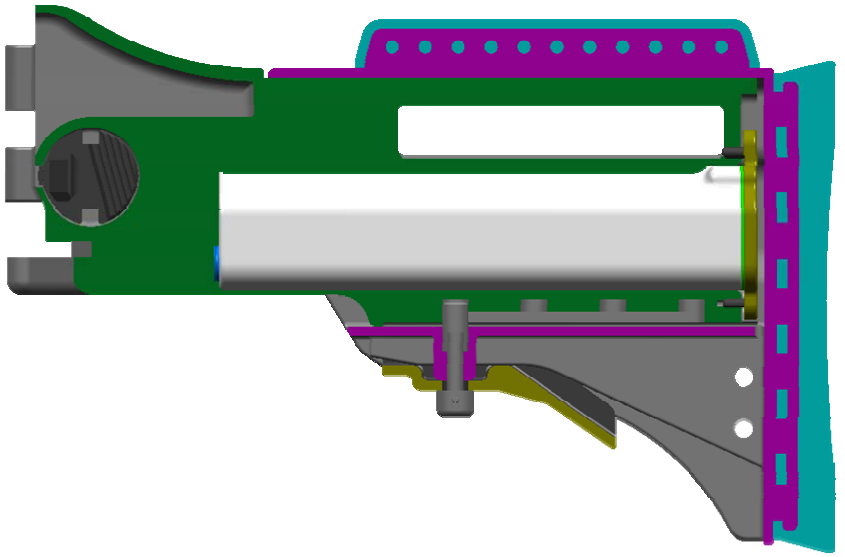
Power requirement schematic
No data connection

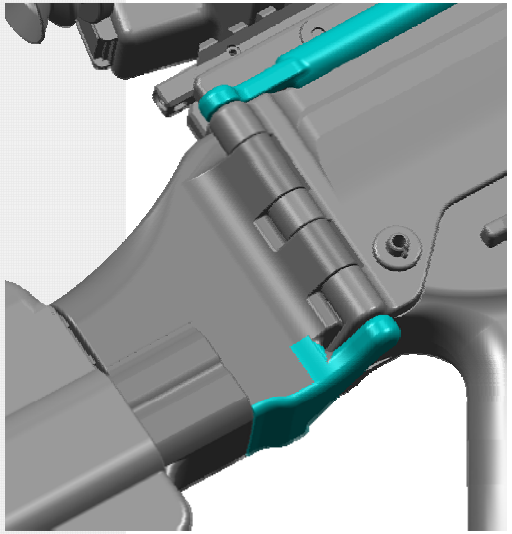
Compatibility: voltage/current

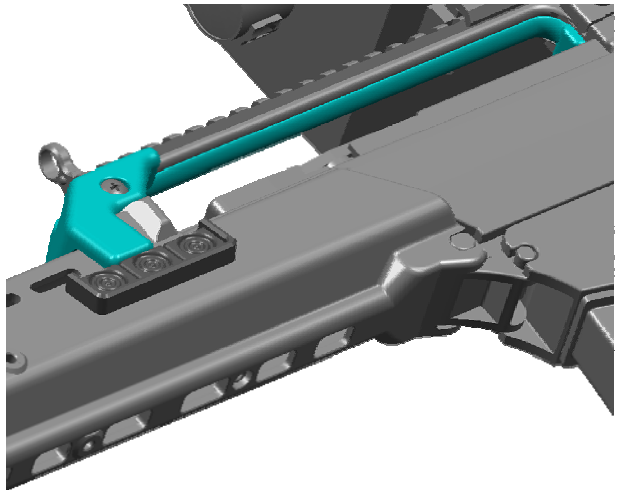


Batteries in Butt stock G36









Concepts on Power Wiring/Distribution

- ***Questions to other Sub-groups***

Human Factors what is weight distribution/balance effect if power moved to back of weapon (how much weight in the rear of weapon gives better balance).

Also possible to have weapon for "Power storage" at times? ie. Carry extra battery (walking, non-combat)

Interface group about butt stock option for battery (which feeds to power rail) and form factor of power source (would like commonality - same for all "family" of weapons).

Concepts on Power Wiring/Distribution

Concept 1:

No device shall have a battery, all power comes from "outside" the weapon (typically from soldier system torso etc.)

- Advantage

Takes all weight of power in devices (up front of weapon) and puts them on the soldier

- Disadvantage

Loose connection to soldier then loose power to devices

This is part of report for draft completion this year (To be explored by NLD)

Concepts on Power Wiring/Distribution

Concept 2:

Move power source to back of weapon for high power consumers.

- Some devices (lower power for example) may still contain individual power source
- Best location of power source in this concept.

Butt stock, power rail, grips etc.

This is part of report for draft completion this year (To be explored by DEU)

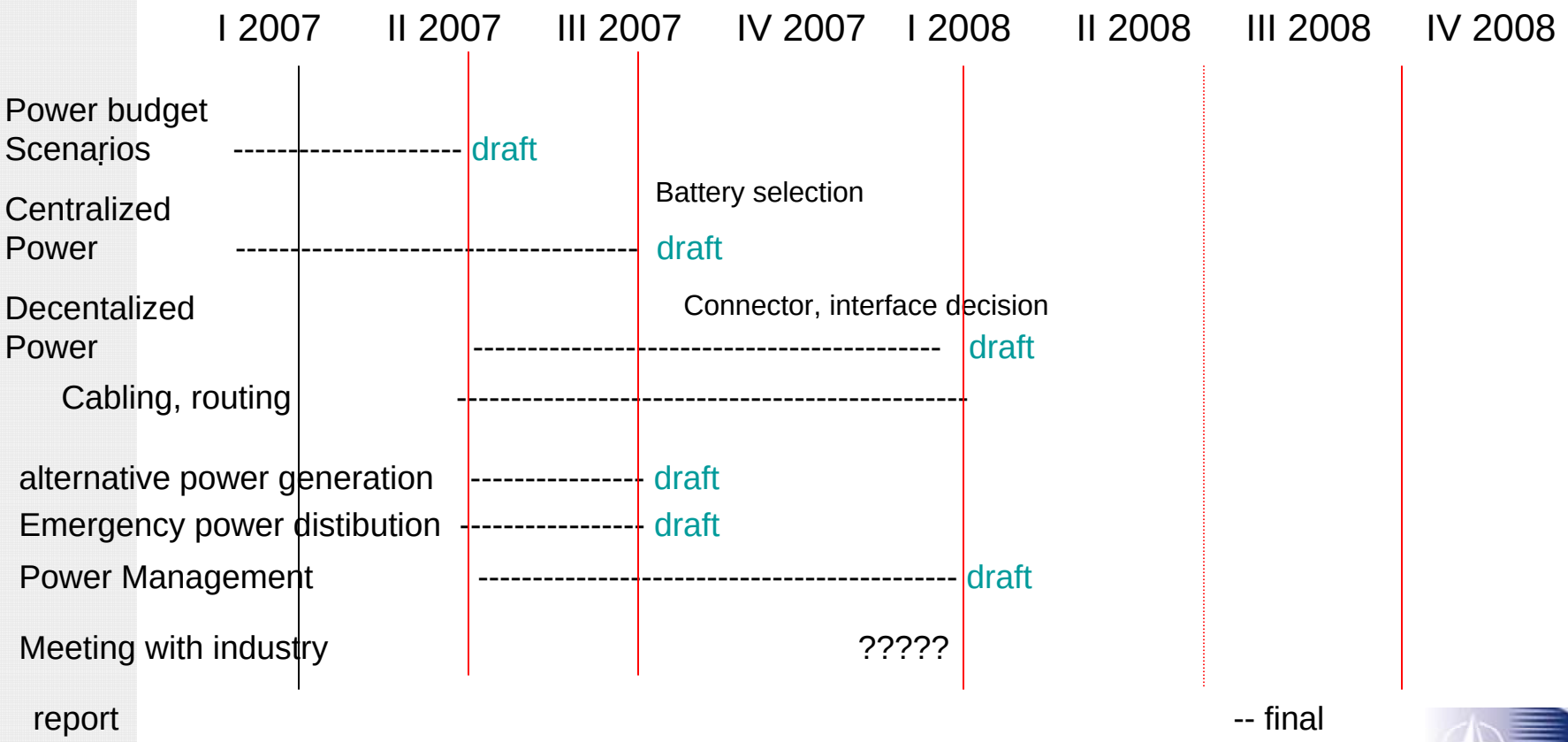
Concepts on Power Wiring/Distribution

Concept 3:

"Christmas tree" approach - Everything has own power source

- Current situation for "most" weapons today
- Try and lower power at device level.

Time Schedule



Near Term Efforts

- Human Factors simulation study at Army Research Lab, Aberdeen Proving Grounds
- Live Fire Weight Test Rig
- User trials
- National studies in specific areas
- Zero retention verification tests
- Powered rail system testing
- Next meeting: 12-14 June 2007 Quebec City Canada

Industry Participation

- Participation of Industry encouraged to assist in the success of this Task Group.
- Provide support to the sub groups areas of expertise.
- Sponsorship by a participating nation or information presentation or work.
- Intellectual Property; preference for open source
- Solicitations provided by participating countries
- On schedule; 18 Months left.

SCI-178 RTG-043
Points of Contact

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- Interface Chairman – Mr. Per Arvidsson
  - Per.arvidsson@fmv.se
- Human Factors Chairman – Major Linda Bossi
  - Linda.bossi@drdc-rddc.gc.ca
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- Germany- Karl-Heinz Rippert
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- The Netherlands – Major Franz van Weenan
- Norway- Mr. Haakon Fyske
- Slovakia- Mr. Lubomir Uherik
- Spain – Mr. Angel Perez
- Sweden- Mr. Per Arvidsson
- Romania – Captain Tiberius Tomoiaga
- United Kingdom – Mr. Richard Smith
- United States Army – Mr. Jason Regnier
- United States Marine Corps – Mr. Mark Richter

Project Manager Maneuver Ammunition Systems

"Meeting the Needs of our Joint Ground Forces"

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Other requests shall be referred to the:
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COL Mark Rider
LTC Eric Fletcher
MAJ Dave LaFontaine

Project Manager
Maneuver Ammunition Systems (MAS)-Direct Fire

PM MAS



PM
Small & Medium
Caliber

PM
Large Caliber



PM
Medium Cannon
Caliber



MISSION: PM MAS Provides Direct Fire Combat And Training Ammunition Capabilities To All Warfighters (Army, Navy, Air Force, Marines)

DISTRIBUTION STATEMENT A:

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PM MAS
FY07 Procurement Quantities
(What we are Ordering)

		2007
Small Caliber (1367.1M) 	5.56MM	937.5M
	7.62MM	311.2M
	.50 Cal	72.7M
	9MM	37.0M
	MISCELLANEOUS	5.7M
Medium and Medium Cannon Caliber (27.5M) 	20MM	4.6M
	25MM	2.2M
	30MM	5.9M
	40MM	14.8M
Large Caliber (207K) 	105MM	.012M
	120MM TRAINING	.178M
	120MM TACTICAL	.017M

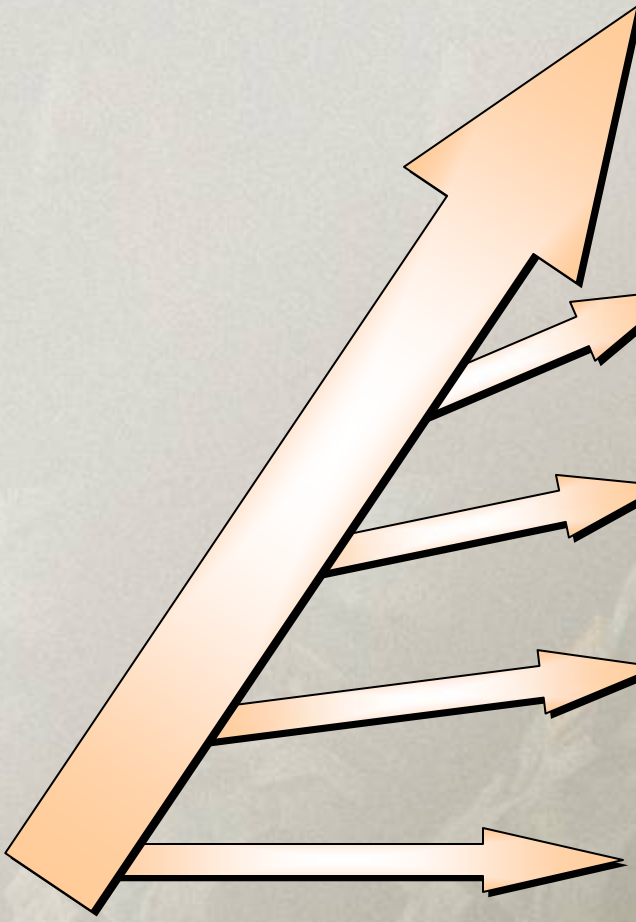
NOTE: All Services FY07 and Projected Supplemental

$1.4B for FY07

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Priority Road Map- Overall PM MAS Primary Efforts



1
Ammunition Production

- Continued Emphasis on Quality & Quantity
- Full Production Ramp Up / Management of New Systems Contractors (Small Cal. & 40mm)

2
Mid Range Munition (MRM)

- Position for MRM MS-B and Contract Award

3
Improve Direct Fire Industrial Base

- Lake City Contract
- Modernization of Lake City
- Alternate Sources
- Right Size Capacities

4
Implement Lethality and Green Ammo Improvements

- Know the Science
- Use M&S
- Improve Ammo Capabilities

5
Position for the Future

- AMP / AKE
- 30mm FCS
- BRAC Mitigation

DISTRIBUTION STATEMENT A:

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Golden Age of Ammunition

- **In All Direct Fire Ammunition Families; Delivering at Highest Levels Since the Vietnam War**
- **For Last Four Years, Direct Fire Ammunition Funding has Been a Senior Leader Priority**
- **Industry and Your Personal Efforts Have Made it Possible…**

DISTRIBUTION STATEMENT A:

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Outlook for Direct Fire Ammunition: Challenges Ahead, but Opportunities Exist

- **Outlook for Future Years Has Dramatic Fiscal Challenges…**
- **Strategic Situation**
  - **Requirements: Have Stabilized and In Many Cases Decreased**
  - **Production: Industry Has Stepped Up to Meet Warfighters Demand…Greater Product Inflow**
  - **Expenditures: Training Usage in Some Cases Decreased; War Expenditures Down From 2003 Levels**
  - **Inventory: Still Low, But Increasing Daily…**
- **Opportunities Do and Will Exist…**



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Small and Medium Caliber Ammunition







LTC Eric Fletcher
Product Manager
Small and Medium Caliber
5.56mm, 7.62mm, 9mm, .50 Cal, 40mm

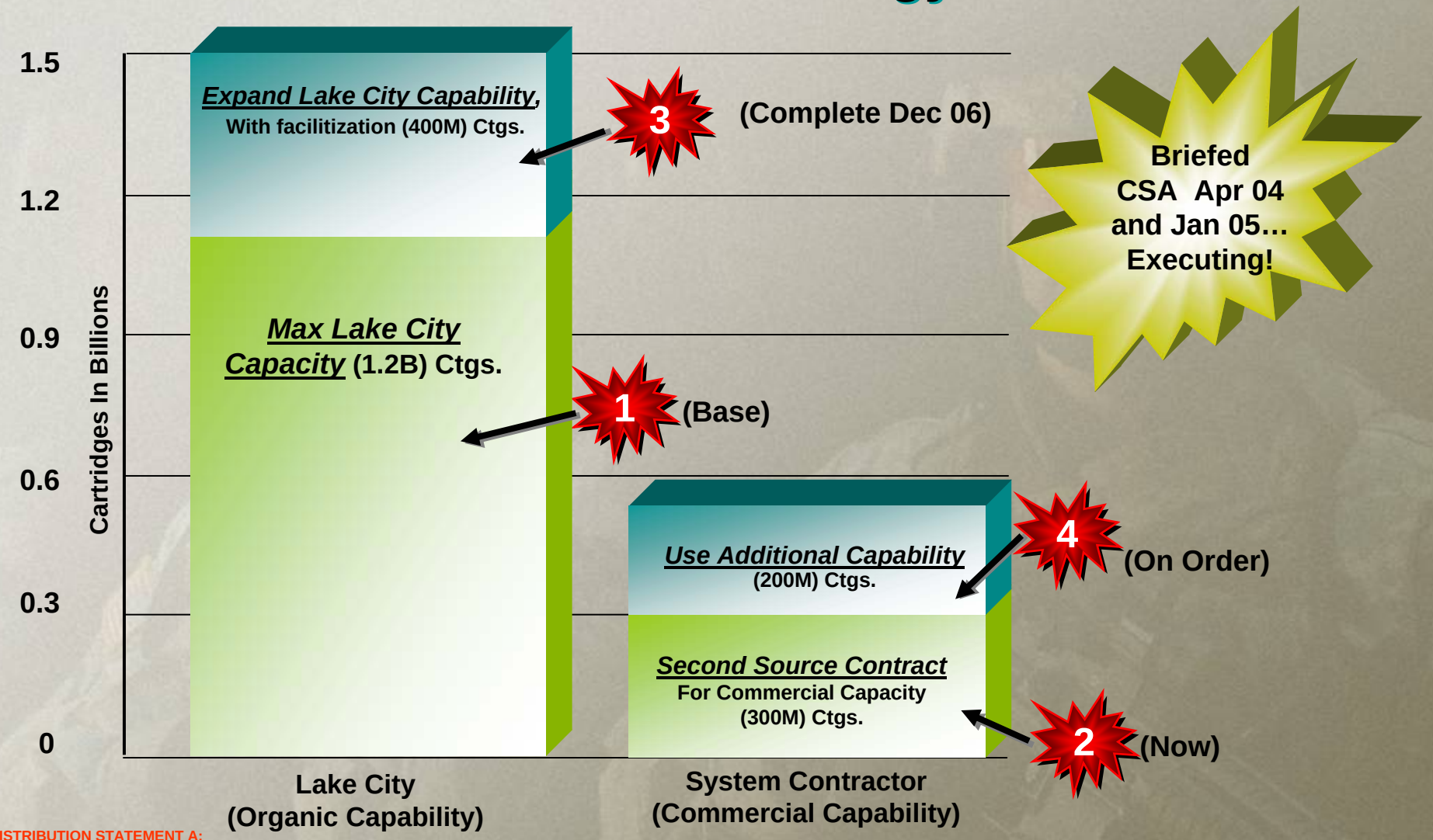


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Small Caliber Acquisition Strategy

1-2-3-4 Strategy

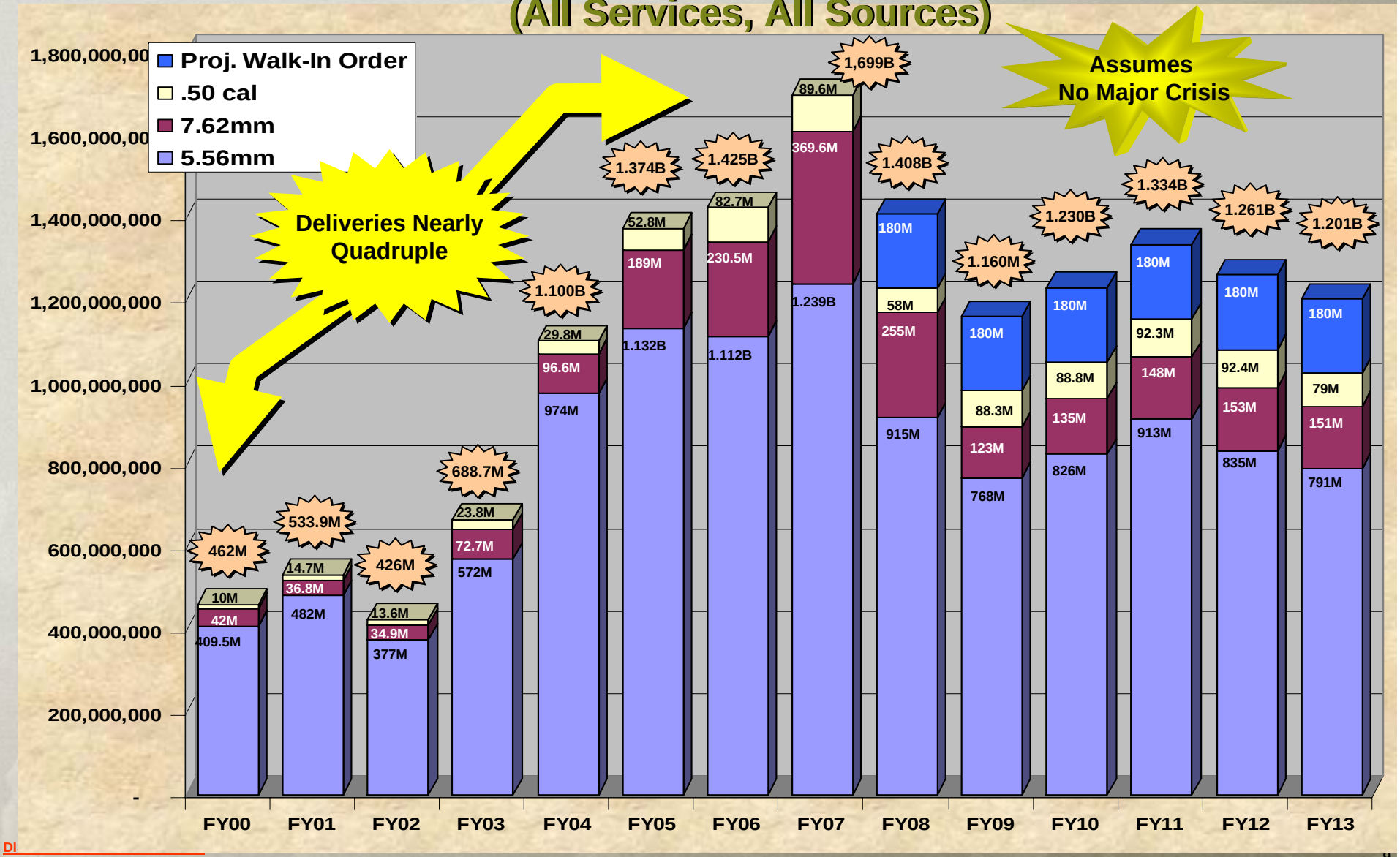


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Small Caliber Ammunition Deliveries

(All Services, All Sources)



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40MM Grenade Family of Munitions
Empowering Small Business

Critical Munition for the Warfighter!

Mk 19
Grenade Launcher
(High Velocity 40MM)



M203
Grenade Launcher
(Low Velocity 40MM)





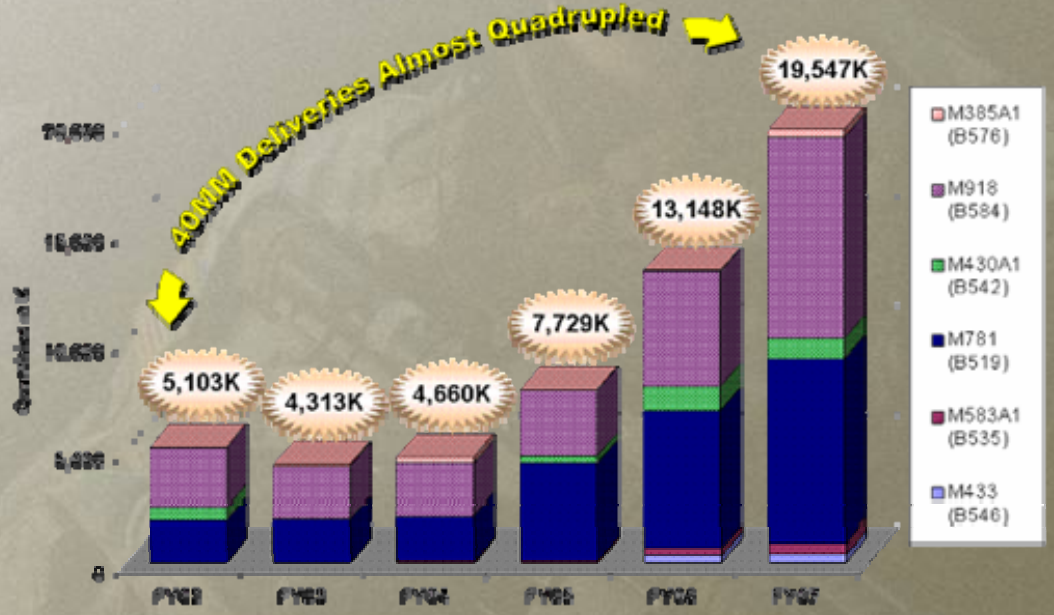
Examples of High and Low Velocity 40 MM Grenades



M918 M430A1 M781 M433

High Low

- **Small Business Is the 40MM Industrial Base**
  - Pre-APR 05, 40MM Contractors Not Empowered – Made Components Not Products (Over Two Dozen Contracts!)
  - Poor Acquisition Approach (Govt Was the Integrator) – Low Funding Led to Inefficiencies, Quality Issues, Low Production
- **APR 05 to Present, PM Maneuver Ammunition Systems (PM MAS) Empowering Small Business:**
  - Implemented a Systems Approach With Contractors Leading
    - Two Joint Venture Small Business Teams
    - Two 8A Team Members
  - Approached Products as a Family Not as Individual Items
  - Championed and Secured increased Funding



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Future Years Outlook

Small Caliber 	5.56MM	→	-12%
	7.62MM	↘	-64%
	.50 Cal	↗	+25%
	9MM	↑	+100%
	40MM	↗	+22%

(Percentages based on POM yrs 1 & 2 versus FY 06 & 07)

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Industry Opportunities

Technologies the Army is Looking to Obtain

- **Improved Lethality**
  - 5.56mm thru 40mm
- **Cost Avoidance**
  - Packaging, Materials, Reduced Weight
- **Advanced Fuzing**
  - Self Destruct, Increased Reliability, Cheaper
- **Reduced Signature**
  - Reduced Flash, Smoke, Non-pyrotechnic Tracer
- **Improved Accuracy**
- **High Energy Propellants**
  - Higher Velocity, IM Attributes, Temperature Insensitive

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Small and Medium Caliber Ammunition







MAJ David R. LaFontaine
Assistant Product Manager
Small and Medium Caliber
5.56mm, 7.62mm, 9mm, .50 Cal, 40mm



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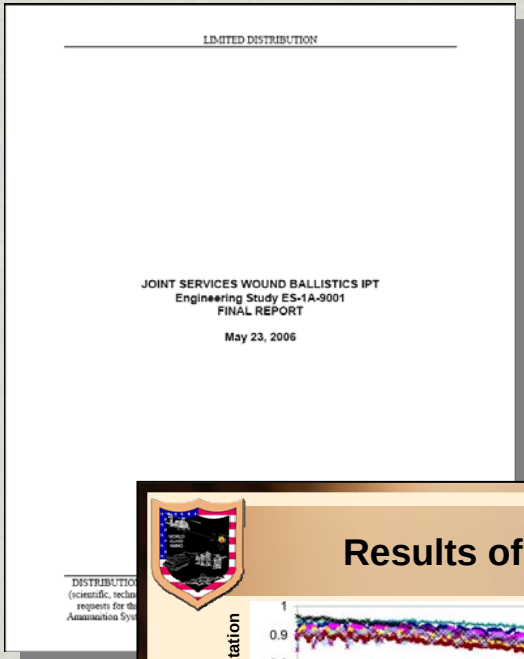
Responding to the Field

- **2002: Performance vs. Unarmored Targets in Close Quarters**
- **2006: Performance vs. Intermediate Barriers—Windshields, Car Doors, Building Materials**

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Report on CQB Performance

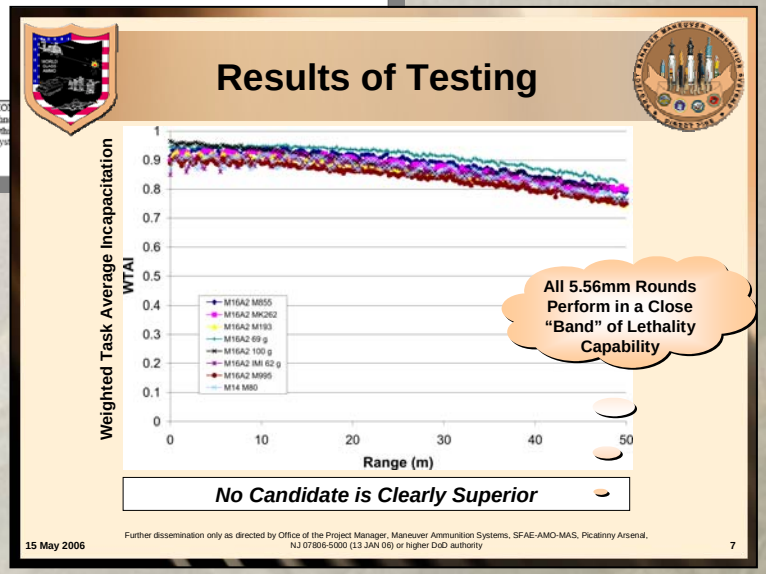

LIMITED DISTRIBUTION

JOINT SERVICES WOUND BALLISTICS IPT
Engineering Study ES-1A-9001
FINAL REPORT

May 23, 2006

DISTRIBUTION
(scientific, techn
requests for th
Ammunition Sys

- **There Is No Significant Difference Between M855 and Commercially Available 5.56mm Rounds**
- **Shot Placement Far Outweighs the Minor Differences Among Rounds**



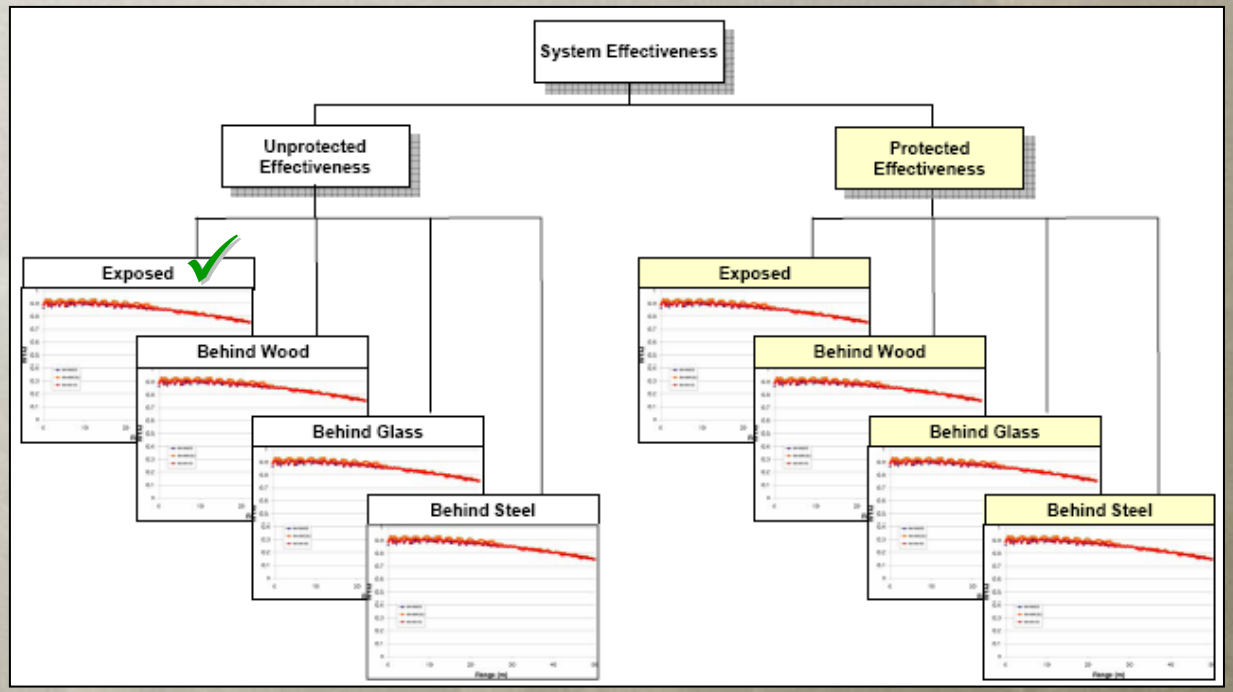
- **Weapon-Bullet Interaction Varies Greatly and Affects CQB Performance**
  - **Outweighs Differences in Ammunition Type**
  - **Causes Variation in Soldier Experience**

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Small Caliber Effectiveness Assessment Program

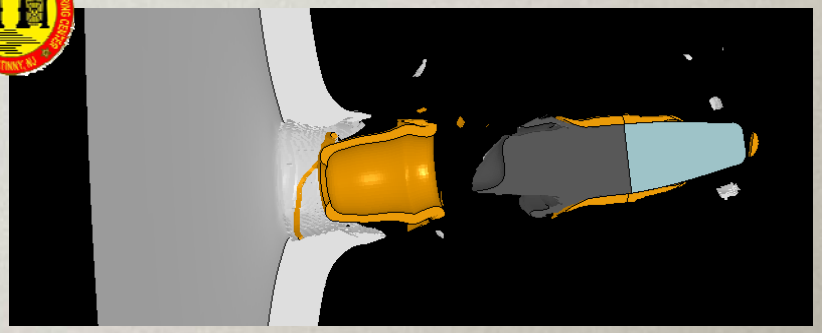
- **Develop Effectiveness Baselines For Small Caliber Ammo That Includes:**
  - **Full Range Of Engagements Beyond CQB (I.E. 50-600m)**
  - **Battlefield Realism (Posture, Barriers, Armor Protection)**
- **Prioritization Of Effort:**
  - **5.56mm Green, M855, M995, Mk262, And M80**
  - **Ideas For Materiel Approaches To Support DA Small Arms Strategy Development**



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Performance Behind Intermediate Barriers: Going Beyond V50

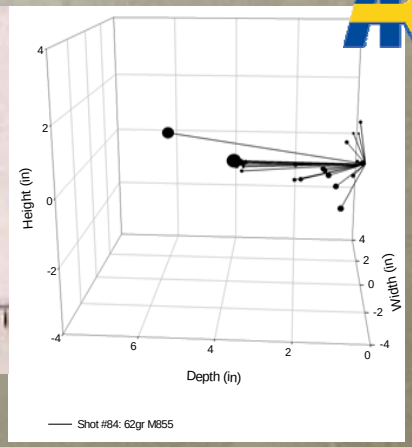


Shown here: M855 @ 2000 fps, 1 deg AA, against 1/8" NATO plate. Courtesy of Mark Minisi, US Army ARDEC.

Observing characteristics such as: Material Deformation, Material Failure, Target Plugging, Projectile Orientation, to determine EFFECTS behind hard targets, not just penetration

Shown here: M855 @ 3040 fps against 3/8" NATO plate. Courtesy of Tyler Ehlers, Lee Magness, US Army Research Laboratory





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Green Ammo Phase II

- **Program Objectives:**
  - **M855 Replacement Program**
  - **Introduction of Environmentally Compliant Materials**
  - **Minimize Cost Impact**
  - **Assess Terminal Ballistics (as a Minimum Meet M855 Performance)**
- **Execution:**
  - **Joint Program Between ATK, ARL, ARDEC, Industry Partners, and User Community**
  - **Utilizes Latest Evaluation Techniques**
- **Phase II Nearing Completion (May 07) With Down-Selection Pending**
  - **14 Designs Tested**
  - **Erosion / Reliability to be Completed Summer 07**
- **Path Forward - Phase III**
  - **Will Focus on Optimization, LRIP, Qualification and Release**
  - **Allows for Design Configuration to Mature Prior to Full Scale Production**
  - **Lessons Learned Being Applied to M856 Tracer and M80 Ball**

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Near/Mid Term Focus

- **Production**
  - Remains Top Priority
  - Requirements Diminished But Still High
- **LCAAP Modernization**
  - Strategic Asset – Still Produces Majority of Small Arms Ammo
- **40mm High Velocity Training**
  - Mixed Belt – M918/M385
  - MK281
- **40mm Combat Round Improvements**
  - M433, M430A1
  - Focuses on Producibility Enhancements and Cost Savings
- **Green Ammo**
  - Could Replace Majority of Current Combat Needs

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Panel Discussion

Questions?

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GENERAL DYNAMICS
Armament and Technical Products

National Defense Industrial Association

Joint Services Small Arms Systems Annual Symposium
May 7-10 2007



Mechanical System Simulation of the XM307 Advanced Crew Served Weapon

Presenter: Callista Rodriguez

Principal Design Engineer- Mechanical Analyst

General Dynamics ATP, Burlington VT

Phone:(802)657-6536 email: crodrigu@gdatp.com

DISTRIBUTION A- Unlimited

XM307

- Lightweight portable crew served weapon
- Fires 25mm air-bursting or armor piercing ammunition
- Low recoil achieved with double acting buffer and unique operating cycle
- Tripod or vehicle mount



XM312

- .50 caliber variant used to speed development efforts
  - 25mm airburst ammunition in parallel development
  - .50 caliber ammunition impulse similar to 25mm
  - .50 caliber ammunition provides a cost effective development tool



XM307 Firing from Tripod

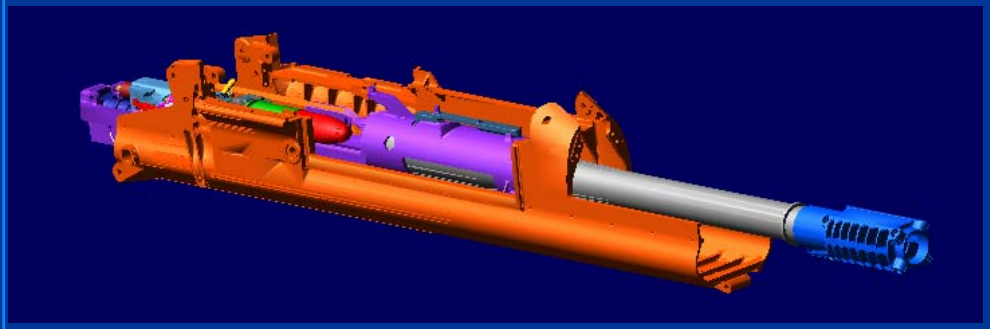


Design Objective / Approach

- Objectives:
  - Modern lightweight self-powered crew served weapon
    - Minimize recoil to fire accurately from un-ballasted tripod
    - Fire effectively between ±70 degrees attitude within operating environments
  - Minimize development time

- Approach:
  - Utilize Mechanical Simulation to evaluate design options
    - Incorporates rapid design evaluation
    - Provides good balance between performance objectives
    - Allows evaluation of large number of design options

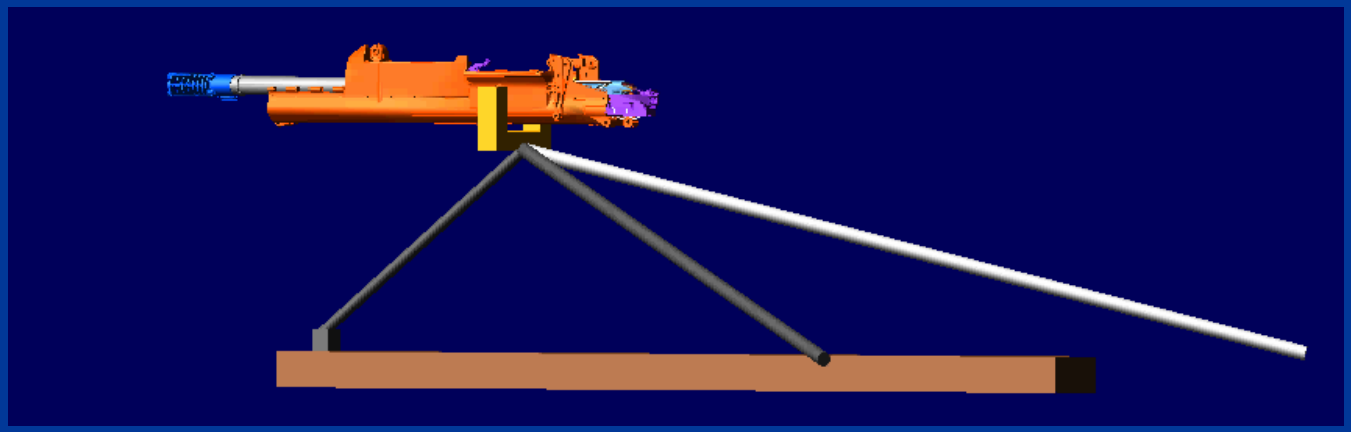
Mechanical Simulation Dynamic Model



- Non-Linear Rigid Body Model Characteristics:
  - 48 Kinematic DOF
  - Mass, cg and inertia of all parts
  - Critical structural stiffness
  - Friction and clearances
- System model:
  - Evaluates performance
  - Calculates interface loads

- Model includes the following system elements:
  - Double acting buffer
  - Main spring
  - Bolt locking mechanism
  - Firing mechanism
  - Ammunition impulse
  - Gas pressure/ unlocking mechanism
  - Cartridge feeding
  - Case eject forces

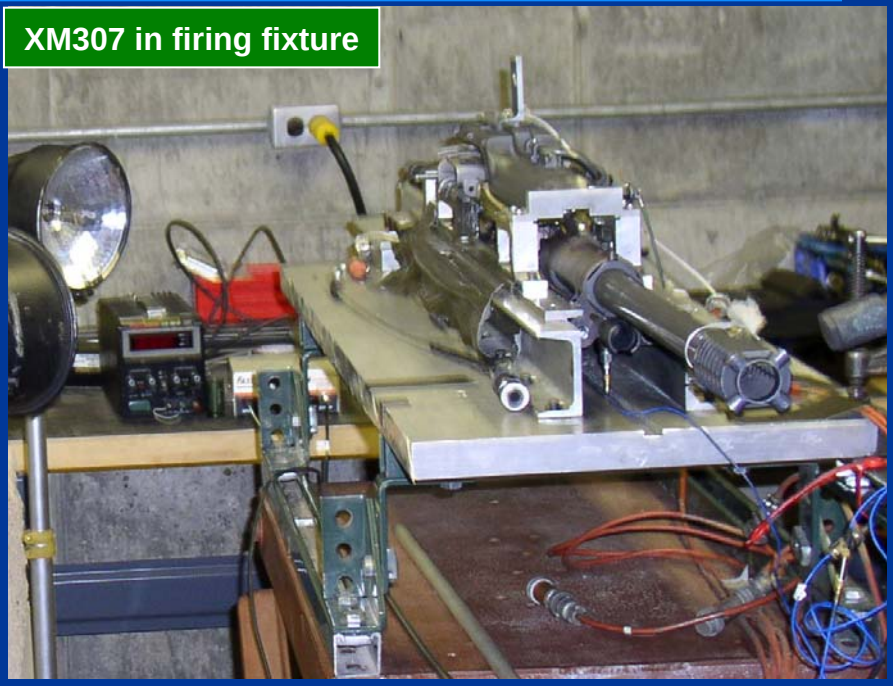
Mechanical Simulation Mounted on Tripod



- Stability assessed with un-ballasted tripod in gunner seated position
- Tripod model
  - Mass, cg and inertia and stiffness included: tripod and feeder
  - Front foot allowed to lift
- Weapon fires from consistent position shot to shot contributing to low dispersion

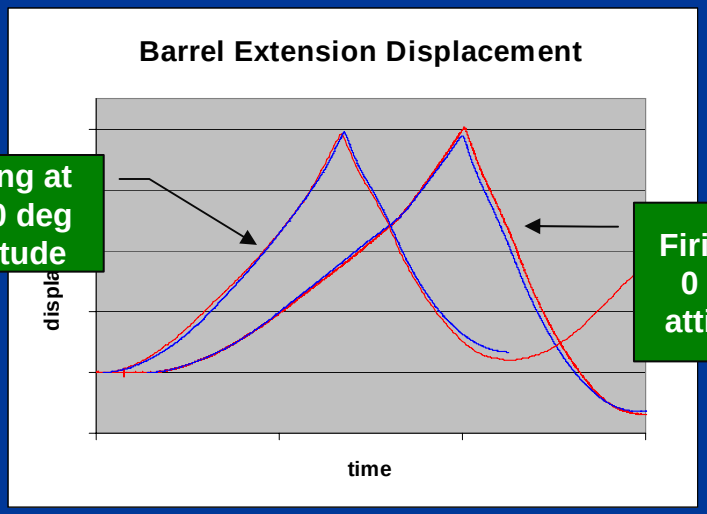
Characterization Firing Tests

- Performed in Fixture
  - Barrel Extension Displacement and velocity
    - High Speed Video and LVDT
  - Transmitted Loads
    - Double acting Buffer and Main Spring
  - System Parameters
    - Gas Pressure
    - Ejection Loads
    - Feeding Torque



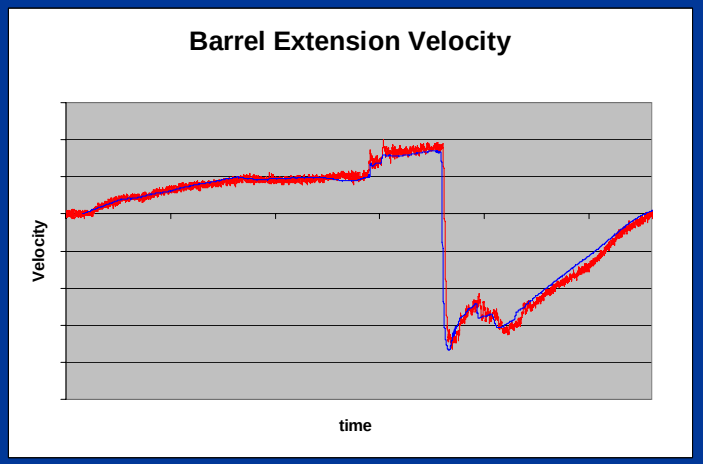
- Performed in Tripod
  - Stability assessed by leg lift measurement

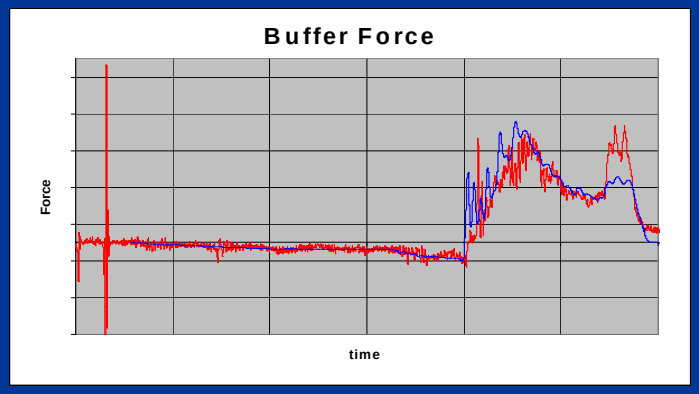
Simulation Model Correlated to Development Weapon Test Data

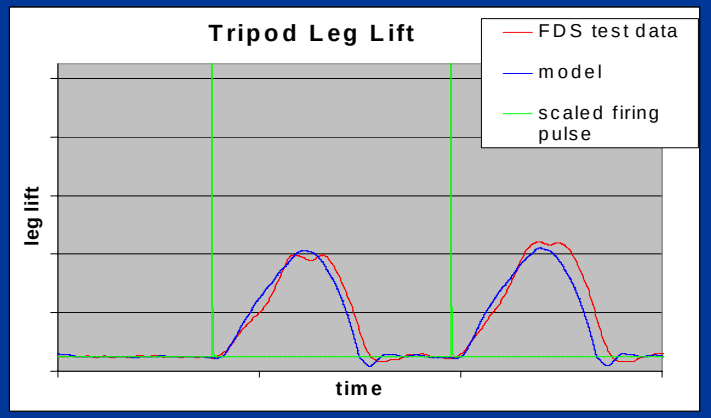


Firing at – 70 deg attitude

Firing at 0 deg attitude







Good Correlation

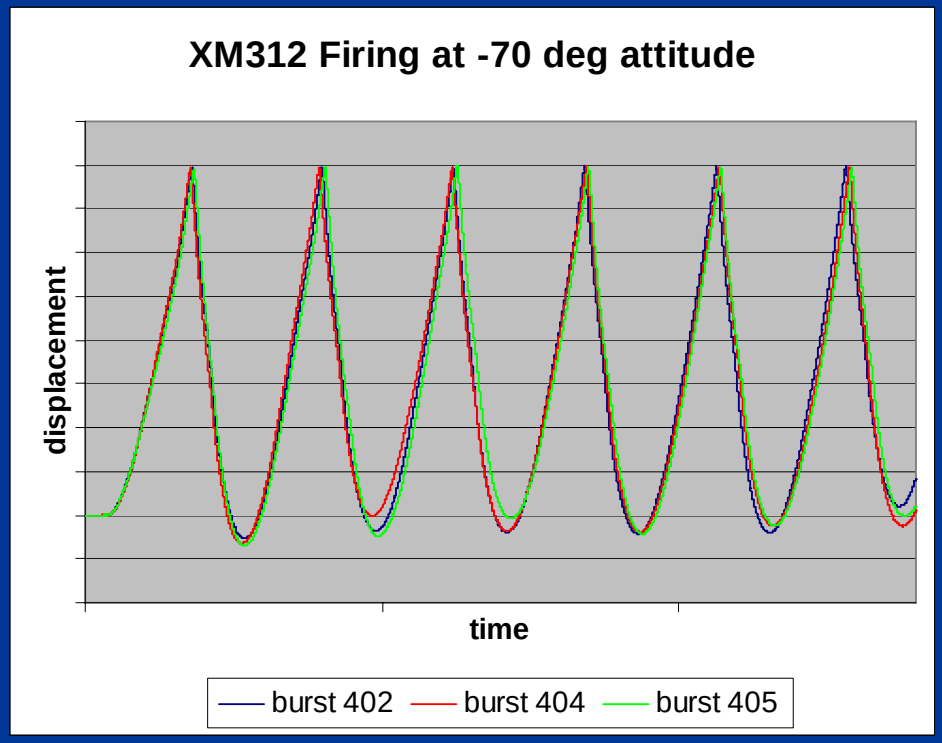
Red Test Data
Blue Analysis

Application of Simulation to Design

- Design Goals
  - Operate successfully at -70 degrees attitude including impulse variation
  - Maintain firing stability from tripod at 0 deg attitude
- Application of Simulation:
  - Perform evaluation of sensitivity and inter-relationships of design and environmental parameters
  - Identify and control key parameters
  - Choose parameters to balance conflicting design goals
- Key design parameters to achieve goals involve double acting buffer
- Simulation increased buffer design efficiency
  - 22 buffer designs investigated including variation of impulse in 3 week period
  - Selected buffer design fabricated and tested in 3 weeks

Results: Successful Burst Firing of XM312 at -70 Degrees Attitude

- Performance goals achieved with selected buffer
  - Fired 3 bursts of 6 rounds each





Summary

Mechanical system simulation was successfully applied to ACSW weapon development

- Rapid turnaround of buffer design achieved with mechanical system simulation
- Design goals achieved
  - Weapon fires successfully at -70 degrees attitude
  - Weapon is stable with accurate fire while on tripod

NAVY SMALL ARMS



CAPT Rick Ruehlin
Program Manager, PMS-340
Email: Richard.Ruehlin@navy.mil
Phone: (202) 781-0758

Mr. Bruce Reese
APM, Navy Small Arms Program
Email: Bruce.Reese2.ctr@navy.mil
Phone: (202) 781-0595

Navy Small Arms

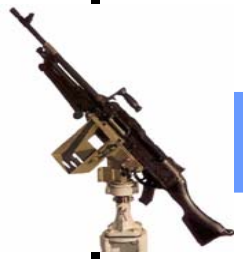
- Full life cycle support for the Navy's small arms
  - Engineering
  - Acquisition
  - Maintenance, Repair & Overhaul
  - Weapons Distribution
  - Acquisition and acquisition support are provided for all small arms, mounts and related equipment
    - **Majority of acquisitions are from Army or direct from OEM**
    - **Occasional modifications to in-service weapons/mounts**
    - **1,223 worldwide activities**
    - **Over 422,000 weapons**

Navy Small Arms Program

Road Map

Small Arms Modernization Way Ahead

Existing Systems — Emerging Systems

FY2005	FY2006	FY2007	FY2008
Medium Machine Guns			
 M60			M240N/B
 M60E3 / MK43			
Mounts			
 MK26 MOD17			MK93 Universal Mount
 MK64 MOD 4			
 MK82			MK97 Mount
 MK58			

Small Arms
Modernization Way Ahead (cont.)

Existing Systems — Emerging Systems

	FY2005	FY2006	FY2007	FY2008
Rifles	 M16A1HB		 M16A3	
	 M14			
40MM Grenade Launcher	 M79		 M203	
Carbines	 Colt 727 Carbine		 M4A1	
Surface Ship Machine Gun	 MK44 Mini Gun		 Twin M240 MG	

What can industry do for Navy Small Arms?

•Navy Afloat
- •Problem - Harsh sea environment corrodes weapons
- •Need – Improved maritime coatings or materials

- •Problem – Weapons and ammunition are stowed below deck and must be transported top side using ladders, hatches, etc.
- •Need – Lighter, smaller, more compact weapon and ammunition

- •Problem - Weapon round counts are inaccurate
- •Need – Automatic round counters

•Navy Shore Stations
- •Problem – Increased training requirements for crew served weapons
- •Need – Reduced range training ammunition requirements for M240, M2HB, MK19 by using virtual simulators, etc.

- •Problem – Increased security at check points at base entrances and piers.
- •Need – Ability to choose between non-lethal or lethal force, rapid transition from less than lethal to lethal

•Naval Air
- •Problem – Overheating barrels on XM218 / GAU16 Light Weight .50 cal MG barrels
- •Need – Barrels that can be fired maximizing the number of rounds on target per aircraft pass

BACKUP

Small Arms
7.62mm Machine Gun Modernization

- Replace the obsolete M60 7.62mm Machine Gun (MG)
  - $23.0M FY05 supplemental funds used to procure 1925 each M240 MG as replacement for the M60 MG
    - Includes mounts, initial issue kits, and spare parts
  - $9.4M FY06 supplemental funds used to procure additional 1110 each M240 MG.
  - Replacement of M60s with M240B will be on a priority basis (CFFC will determine priorities).
    - Training Commands
    - Units in direct support of GWOT
    - Deploying Battle Groups
    - Shore stations
    - Remaining Fleet units
  - All M60 basic machine gun should be removed from the active inventory by the end of FY08.

Small Arms
Mount Modernization

- Replace the MK26 Mod 17 and the MK64 Mod 4 with the less expensive and more robust MK93 universal mount
  - 2000+ MK93 mounts on order. Delivery rate approximately 75 mo
  - Capable of mounting both the M2HB .50 cal and the MK19 40mm Grenade Machine Gun
  - With an adaptor, can also mount M240 7.62mm Medium Machine Gun (this option is too expensive under normal circumstance)
  - Transition to the MK93 mount should be complete by 4Q FY08

- Replace the MK58 and the MK82 M60 Machine Gun mounts with the MK97 M240 Machine Gun mounts
  - MK58 and MK82 specific to the M60 family of Machine Guns
  - MK97 is specifically designed to mount the M240 family of Machine Guns
  - 1200+ MK97 mounts on order. Sufficient mounts on hand/on order to meet all requirements.
  - Transition to the MK97 mount should be complete by 4Q FY08

Small Arms
Rifle Modernization

- Replace the M14 7.62mm As the Fleet's Primary Rifle
  - USN is only user of the M14 rifle
  - Too heavy for use in VBSS and MIO operations
  - Too long for use in VBSS and MIO operations
  - Shore establishment and expeditionary units have migrated from M14
  - Fleet desires M16A3 as replacement for M14 rifle
    - Few M14s to be retained for use in line throwing
    - Currently 4,354 M14 rifles in use aboard Navy vessels
- Replacement of Fleet M14 rifles delayed by loss of acquisition funding and increased requirements for the M16A3. Expect transition to be completed by the end of FY07. 6000 M16A3 rifles to be put into or returned to service during FY07 through repair or conversion actions.

Small Arms
40mm Grenade Launcher Modernization

- Replace the M79 40mm Grenade Launcher with the M203
  - M79 is obsolete
  - M203 is designed to fit onto the M16 family of weapons. Results in increased flexibility
  - Relatively few (<900) M79s remain in service. Too expensive to maintain
- FY06 funding being used to procure 750 each M203s. An additional 500 units will be procured with FY07 funding. Replacement of the M79 should be complete by the end of FY07. (A few M79s will remain in service for use as flare guns during tactical training exercises).

Small Arms
5.56mm Carbine Conversion

- Convert the Model 727 carbine to M4A1 configuration
  - USN is only user of the Model 727 carbine
  - Model 727 carbine is out of production
  - Model 727 carbine is not capable of mounting sighting devices
  - $3.0M of the FY05 O&MN supplemental funding is being used to convert 4000 each Model 727 to the M4A1 configuration (parts procurement and SEAPORT contract).
  - Conversion will take place at a rate of approximately 2000 per year FY07-FY08.
  - Model 727 will be completely replaced by the end of FY08
  - CFFC and OPNAV N864G will determine priority of issue
    - Training Commands
    - Units in direct support of GWOT
    - Deploying Battle Groups
    - Shore stations
    - Remaining Fleet units

Small Arms
Surface Ship Upgrade/MK44 Replacement

- Replace the MK44 mini-gun system with Twin M240 MG.
  - MK44 Mini Gun
    - System provided as a rapid response measure after USS Cole incident
    - Fires 7.62mm at 3,000 rounds per minute
    - Electrically driven w/six barrels
    - 80 systems currently in use by Fleet
    - No spare parts support in place
    - Difficult and expensive to maintain aboard ship
    - Requires ship alt to become a permanent emplacement
    - Acquisition cost $72,300 per system (2 per ship = $144,600)
  - Twin M240 MG (Sufficient FY06 funding to procure 160 ship sets)
    - Fires 7.62mm at 1500 to 1900 rounds per minute (combined)
    - Can continue to fire if one gun fails
    - Any of the ship's M240s can be used to replace failed gun
    - Acquisition cost $22,652 per system (2 per ship = $45,304)
    - Procurement of 300 twin M240 w/mount will cost <$7.0M (150 ship sets)
  - Twin M240 MG will be provided in lieu of the MK44 – More efficient use of funding
  - Transition will be complete by the end of CY07
  - CFFC/SURFOR will establish priorities



National Defense Industrial Association Small Arms Symposium

Lightweight Small Caliber Ammunition

Mark S Leng
U.S. Army ARDEC

Lucian M Sadowski
U.S. Army ARDEC

May 8, 2007

This Presentation is Approved for Public Release

Lightweight Small Caliber Ammunition





"The dismounted infantryman continues to be over-burdened while conducting modern combat operations..."

"Reduce Combat Load through doctrine and equipment changes..."

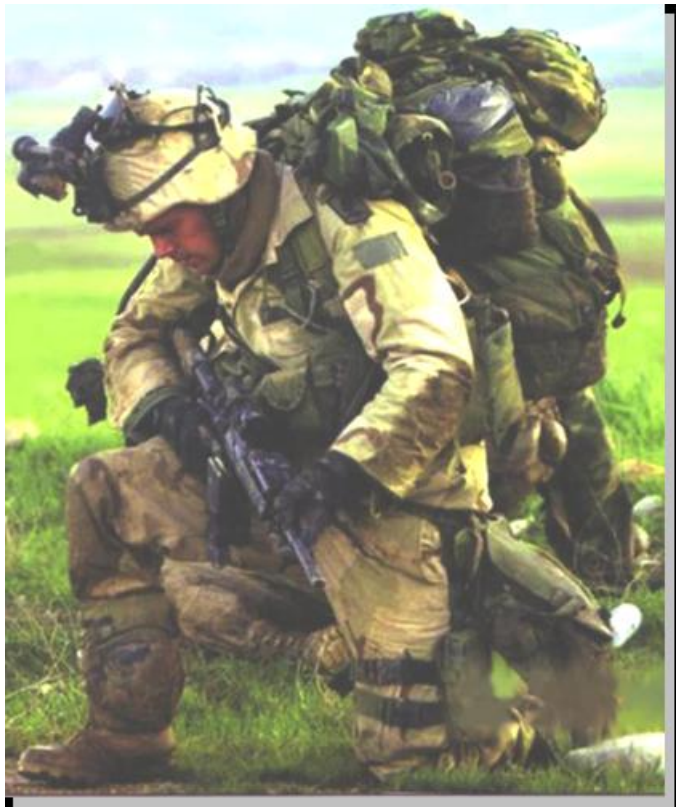
Natick Soldier Center, March 2005

Soldier Load

M240B Machine Gunner

Average Fighting Load 81.4 lbs

of which 6.3 lbs is ammunition



Family of 7.62mm Caliber Ammunition



Blank	Ball	Trace	OHF	Special	Match	Dim
M82	M80	M62	M62	M118LR	M852	M276

Objective

To develop a functional alternative lightweight 7.62mm cartridge case for the M80 Ball and M62 tracer cartridges that meets current ballistic performance and reliability of the current brass alloyed cartridge case

Lightweight Small Caliber Ammunition

Concept:

Thinwall Stainless Steel Cartridge Case

Contractor:

GDOTS Canada (Prime Contractor)

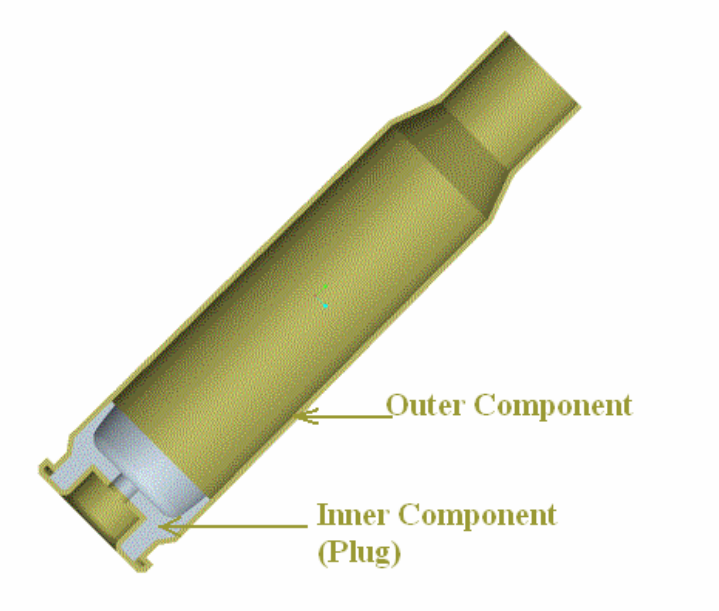
Tasks:

- Design a 7.62mm Lightweight Cartridge Case
- Fabricate Cartridge Cases
- Test Full Up Cartridges in a Mann Barrel and Machine Gun

Lightweight Small Caliber Ammunition

Goal

- Weight savings of 20% over the M80 Ball Brass Cartridge
- Accomplished by thinwall steel replacing current brass case
- Aluminum plug is used in the base to provide structural support



Lightweight Small Caliber Ammunition

7.62mm Weight Savings w/ Alternative Cartridge Case Materials

		Alternative Case Weight Reduction	M80 Assembled Cartridge Weight Savings	Unit Weight M80 Ball Cartridge (gr)	Ammo Combat Load Gunner** (100rds)	Weight Savings (lbs)	Ammo Combat Load Assistant Gunner*** (400rds)	Weight Savings (lbs)
7.62	**Brass**	**0%**	**0%**	**392**	**6.3**	**0**	**29.2**	**0**
GDOTS Canada	**Steel**	**31%**	**20%**	**318**	**5.1**	**1.2**	**23.6**	**5.6**

Weight Distribution Current 7.62mm	
Case	48%
Bullet	38%
Propellant	12%
Primer / lacquer	2%

** Gunner Combat Load total 81.4 lbs / 6.3 lbs ammo

*** Assistant Gunner Combat Load 69.9 lbs / 29.2 lbs ammo

Approach

GDOTS Canada – Expertise in Ammunition Production
Current Second Source for production of Small Arms Ammunition

Fleximation – Patented Thin Wall Steel Concept

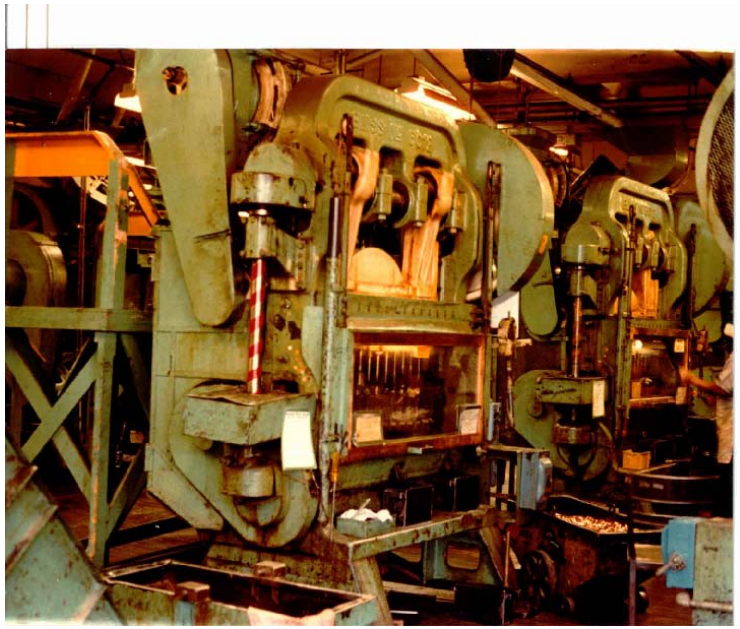
O C Eyelet – Expertise in Commercial Metal Stamping Processes

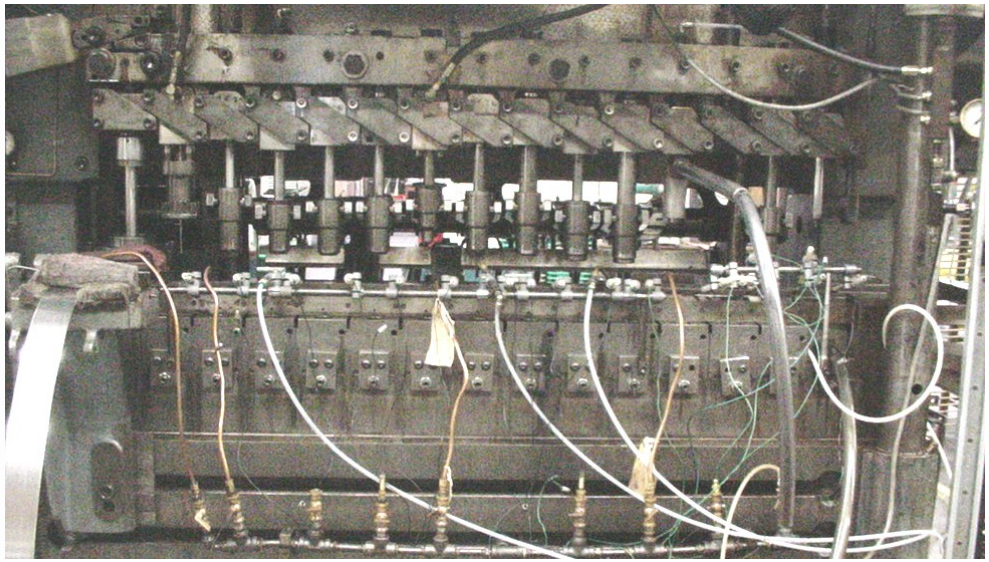
ARDEC – Expertise in Computer Modeling and Simulation

Process

Currently – Brass cartridge case is a base draw process

Concept – Sheet metal folding process





Lightweight Small Caliber Ammunition

Demonstrated the feasibility of a lightweight 7.62mm cartridge based on thinwall stainless steel technology





Lightweight Small Caliber Ammunition

Results:

- Stainless Steel
  Costs less than Brass

- Simplified Manufacturing Process
  Opens Markets for Other Manufacturers

- 20% of total weight of 7.62mm
  M80 Ball assembled cartridge

- Ballistic Performance matches
  current Military MIL-C- 46931
  Specifications



Further Information

ARDEC (Picatinny Arsenal)	***Office***	***Phone Number***
Mark Leng (APO)	AMSRD-AAR-AEM-I	973-724-5688
Lucian Sadowski (COR)	AMSRD-AAR-AEW-M(D)	973-724-2555
Audrey Shabazz (PMSW)	SFAE-CDR-CSW	973-724-6884

GDOTS Canada	***Location***	***Phone Number***
George Feghali	Le Gardeur, Quebec	450-581-3080
Pierre Lemay	Le Gardeur, Quebec	450-582-6361

NORTH ATLANTIC TREATY ORGANIZATION
ORGANISATION DU TRAITE DE L' ATLANTIC NORD
AC/225 Land Capability Group 1
Dismounted Soldier



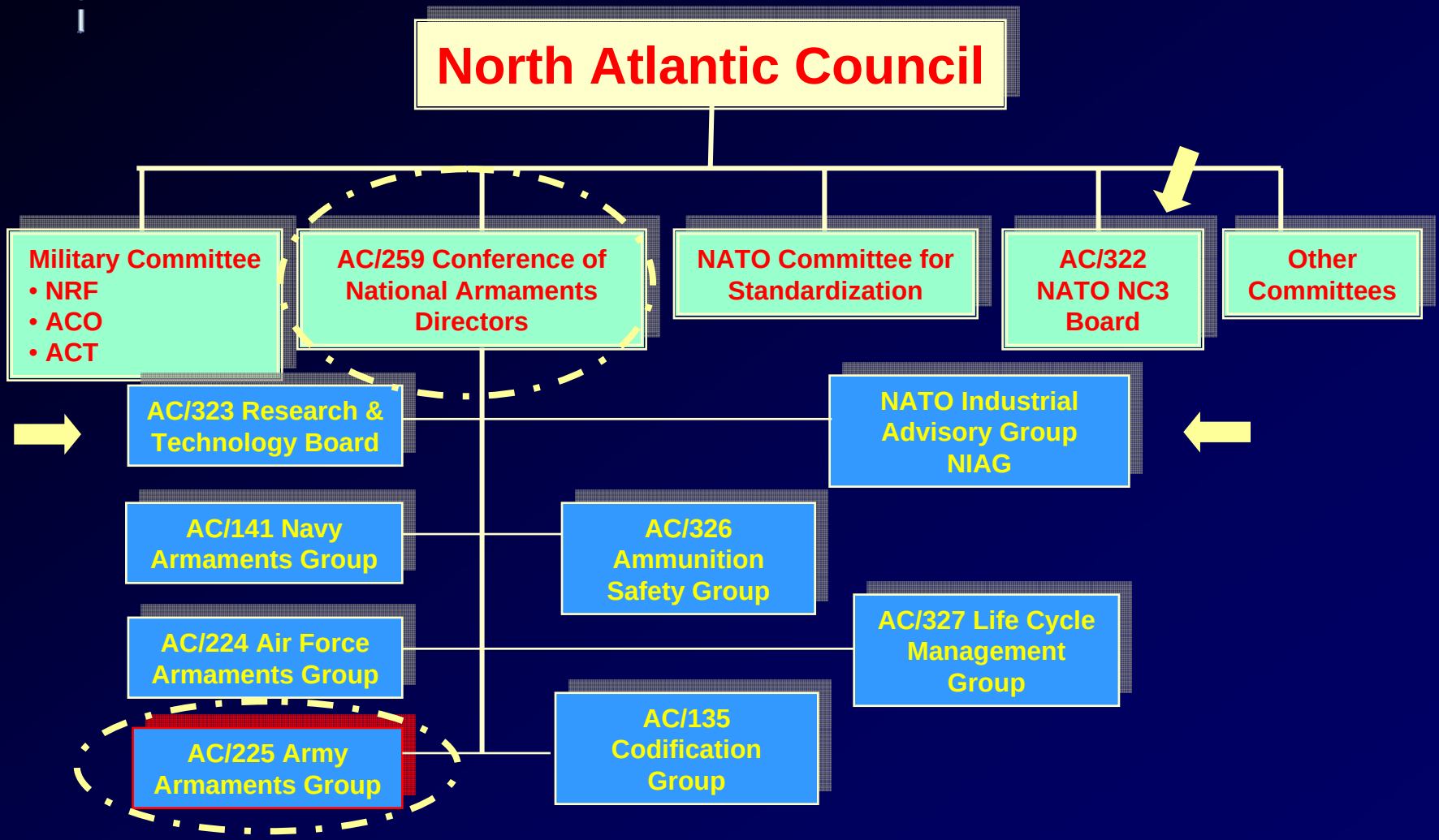






Vernon E. Shisler
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NATO Structure



NATO Army Armaments Group

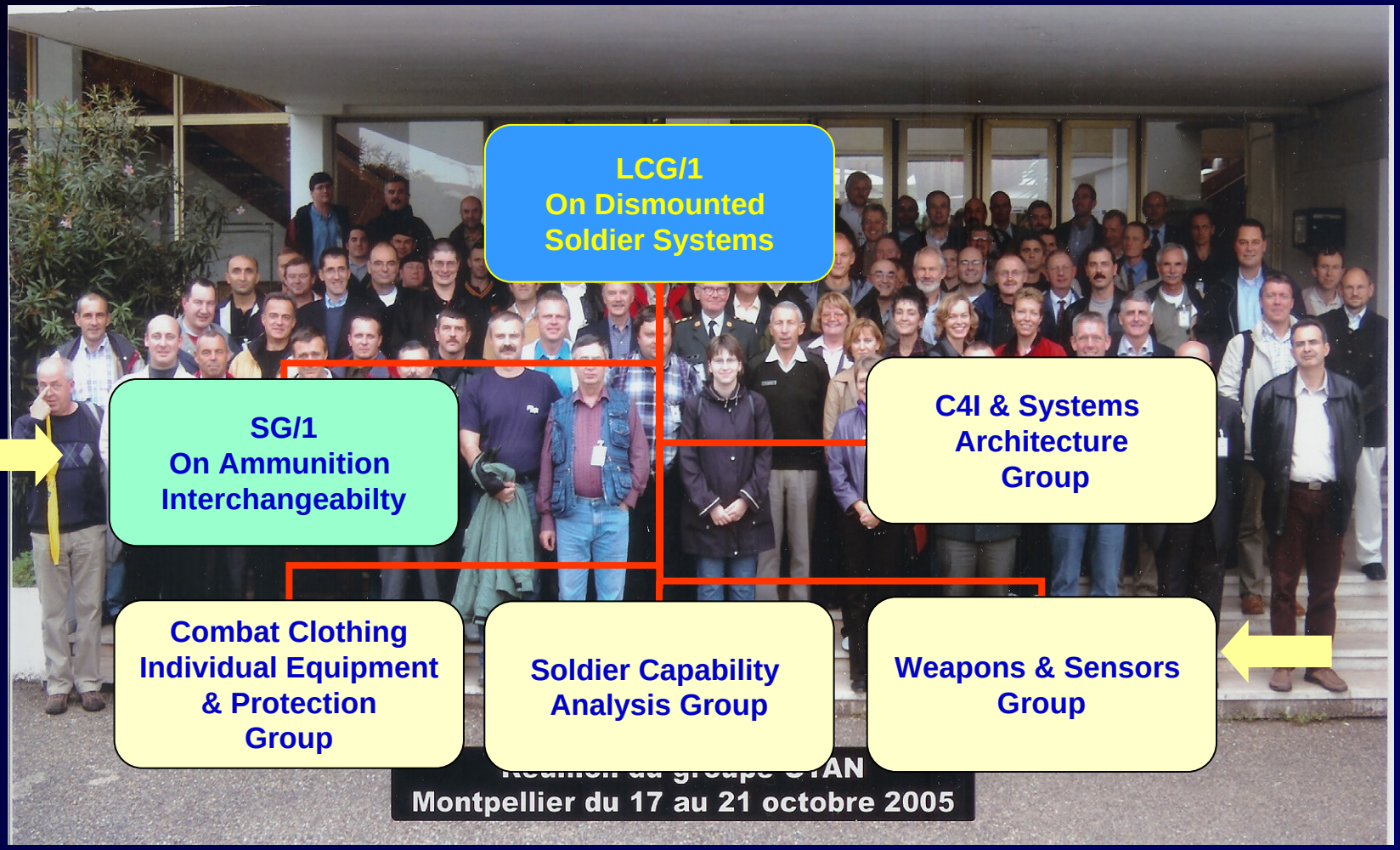
Non-Lethal QRT

AC/225 Army Armaments Group

- **LCG/1 Dismounted Soldier**
  - SG/1 Ammunition Interoperability
  - Weapons & Sensors
  - C4I/Architecture
  - CCIEP
  - SCAG
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Land Capability Group 1 on Dismounted Soldier

LCG/1 and Sub-groups



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Specific Work of LCG 1



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- Serve as oversight and provide operational direction to LCG/1
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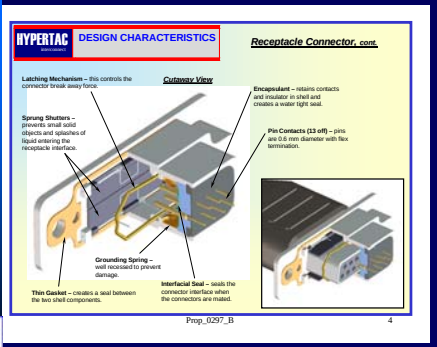
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Specific Work of LCG 1

NATO Symbol of Interchangeability



Sub Group 1 Ammunition Interchangeability



Qualify NATO Ammunition designs

- Certify NATO Interchangeability
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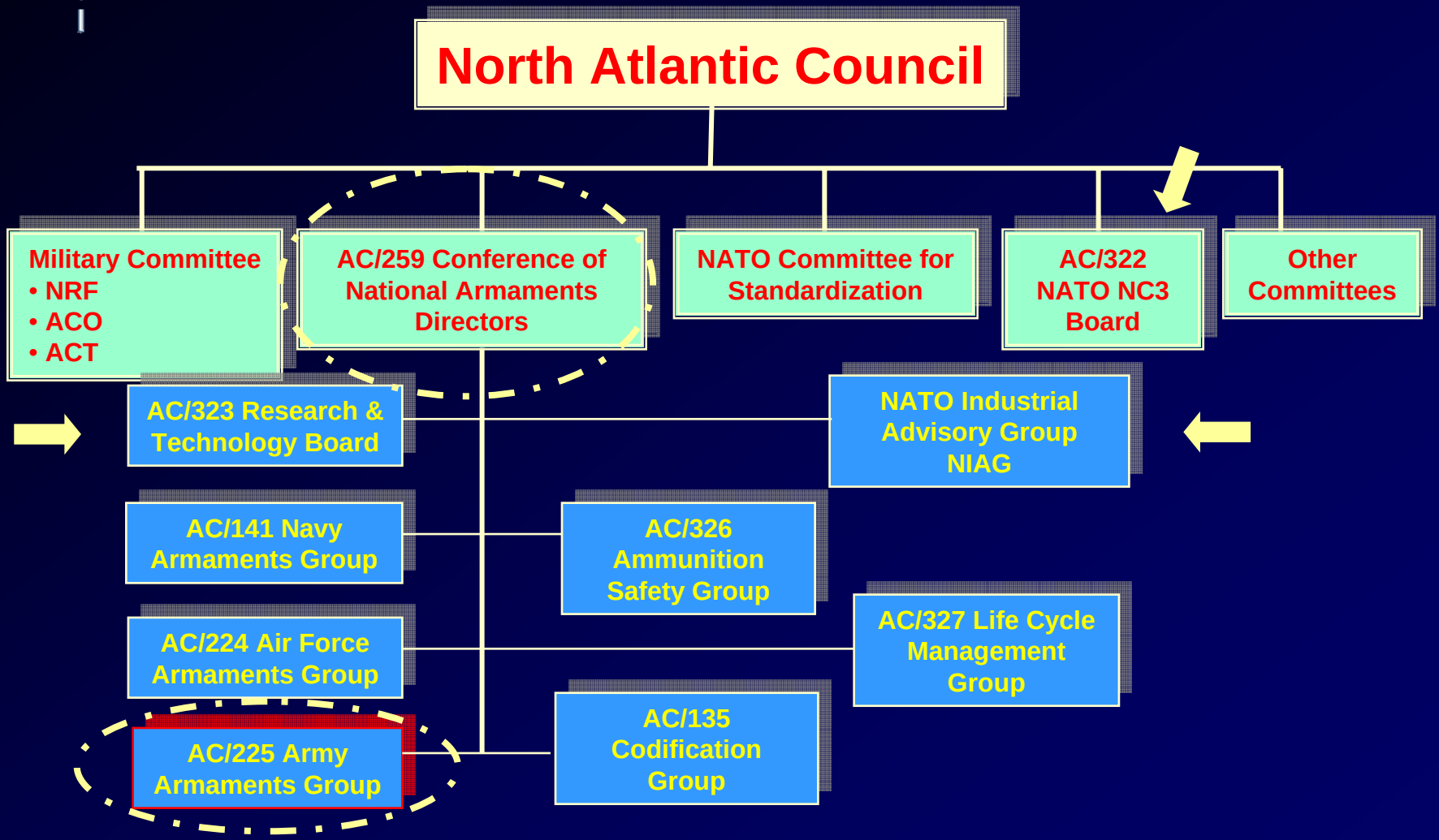






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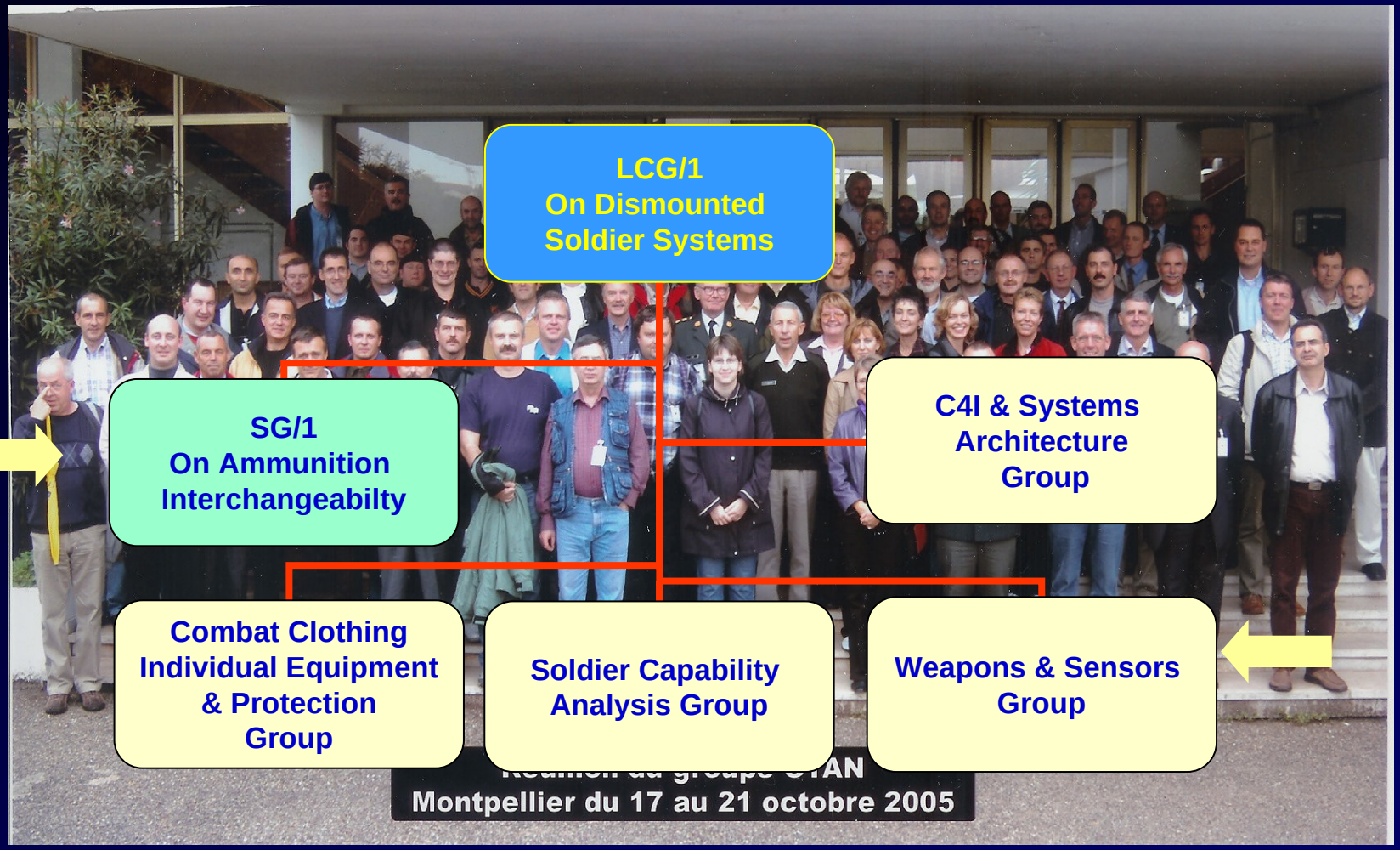
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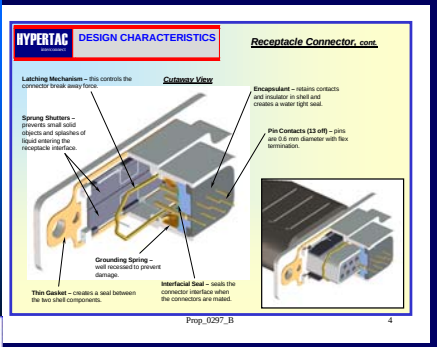
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Possible Business Opportunities Within The SOF Weapons Program



8 May 2007

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Briefing Objectives

- Provide Information Relative To USSOCOM (PEO-SW) Product Areas
- Discuss Typical Acquisition Approach For SOF Weapons
- Relay Information In Regards to ”How And Who” To Do Business With USSOCOM
- Provide Areas OF Possible Future SOF Weapons Business Opportunities

Harnessing the Power of Technology for the Warfighter

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PEO SOF Warrior Systems

COL Kevin Noonan

FOSOV





VAS











Ammo/Demo













Weapons











SPEAR







SOF Weapons Suite

SOF WEAPONS



EX16 MOD 0 (SCAR-L)
SOF Combat Assault Rifle (Light)



EX17 MOD 0 (SCAR-H)
SOF Combat Assault Rifle (Heavy)



EX 13 MOD 0
Enhanced Grenade Launcher Module
EGLM



MK12 MOD 1
Rifle, Special Purpose, 5.56mm
1005-01-504-3276



MK18 MOD 0
Close Quarters Combat Carbine CQBR
1005-01-527-2288



MK11 MOD 0
Rifle, Sniper 7.62mm
1005-01-475-7980



MK46 MOD 1
Machine Gun, Lightweight, 5.56mm
1005-01-534-3682



MK48 MOD 1
Machine Gun, Lightweight, 7.62mm
1005-01-539-4164



MK47 MOD 0
Advanced Lightweight
Grenade Launcher, 40mm
1010-01-522-3257



MK13 Rifle, .300 WINMAG
MOD 0: 1005-LL-L99-5364
MOD 1: 1005-LL-L99-5477
MOD 2: 1005-01-523-4611



MK15 MOD 0
Rifle, Special Application Sniper .50 Cal
1005-01-525-7716



MK23 MOD 0
Pistol, .45 Cal
1005-01-426-8951









NSWC Crane Division
Point Of Contact
sofsustainment@navy.mil

Harnessing the Power of Technology for the Warfighter

Distribution Statement A: Approved For Public Release; Distribution Unlimited

USSOCOM Integrated Weapons Top Map

Existing Systems | **Emerging Systems** | **Objective Systems**

2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015

ASSAULT RIFLES



CQBR



M4A1 Carbine



M14





SCAR Family (SCAR L/H)

- **SCAR Increment 2:** Enhanced FCU
- **SCAR Increment 3:** Enhanced Caliber Formats



SOST Enhanced Ball 5.56/7.62mm

- Proof of Concept Scheduled for May/July 07
- 10K rds Each Caliber June/Aug 07

40MM GRENADE LAUNCHER



M4 203

EGLM



- **EGLM Increment 2:** Programmable Pathway
- **EGLM Increment 3:** Enhanced Caliber Formats

Harnessing the Power of Technology fo

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Typical SOF Weapons Acquisition Approach

- Early Market Research
  - Industry Conference
  - Requirement And Specification Refinement

- Full And Competition
- Commercial Off The Shelf (COTS) Products
- “Fly Before You Buy” Acquisition Approach
  - Product Samples Are Part Of The Proposal
  - Go/No Go Criteria
  - User Assessment To Test/Evaluate The Product Samples Submitted
  - Joint Source Selection Utilizing User Assessment Results, DT Data, Past Performance And Pricing

- Best Value
- Indefinite Delivery/Indefinite Quantity/FFP Contracts

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Doing Business With PM SOF Weapons

- All USG Synopsis:
  - http://www.fedbizopps.gov/
- NSWC Crane:
  - Vendor
  - DoD
  - DON/Offices/NAVSEA/NSWC Crane/Class Code (10 And 13)
- USSOCOM:
  - Other Defense Agencies
  - Offices
  - US Special Operations Command
  - Locations
  - HQ Procurement Division MacDill AFB, FL

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Foreign Comparative Testing (FCT)
Defense Acquisition Challenge (DAC)

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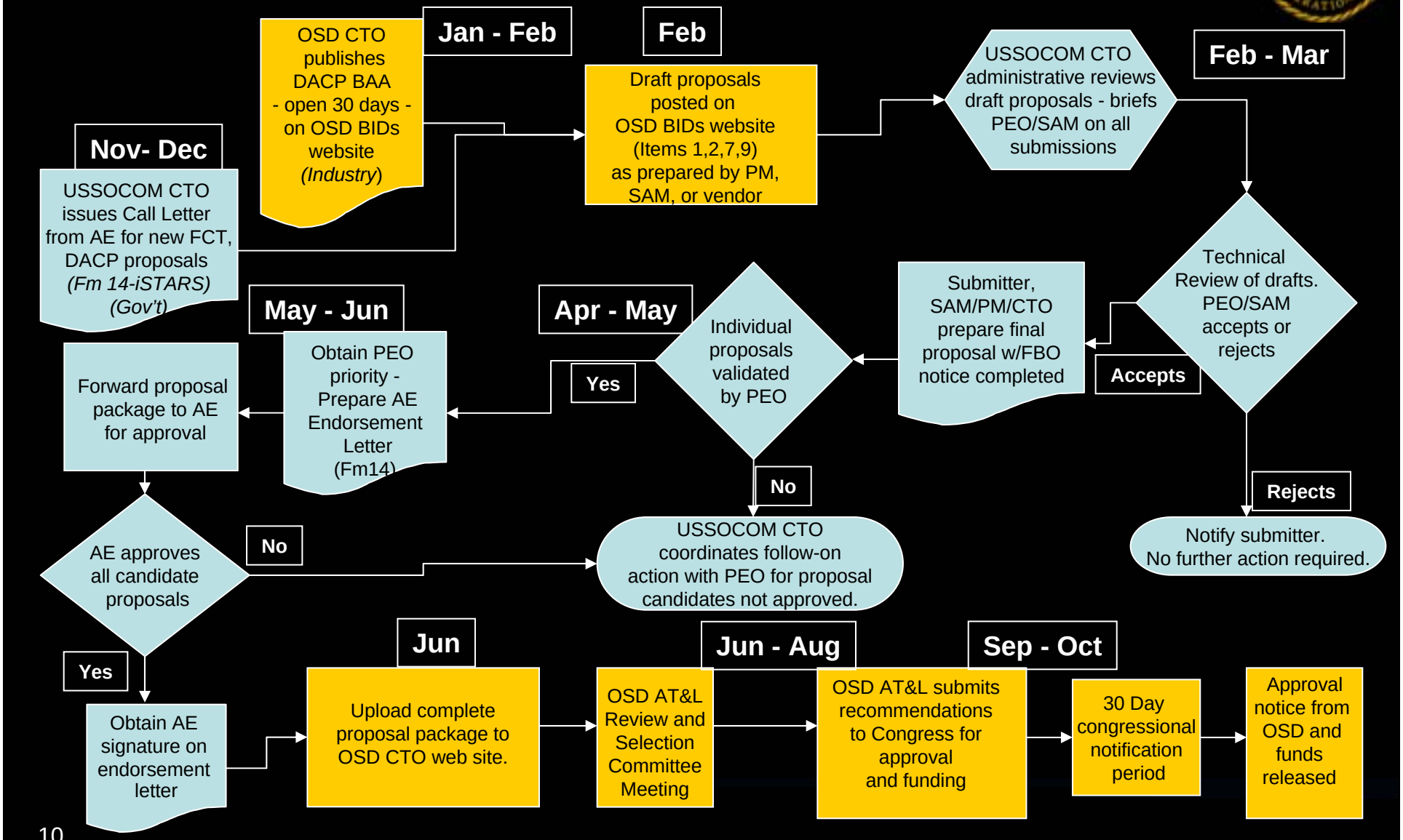
FCT/DAC Objectives

- The Programs' Objectives Are To Improve The U.S. Warfighter's Capabilities And Reduce Expenditures Through:

1. Rapidly Fielding Quality Military Equipment
2. Eliminating Unnecessary Duplication Of Research, Development, Test, And Evaluation
3. Reducing Life Cycle Or Procurement Costs
4. Enhancing Standardization And Interoperability
5. Promoting Competition By Qualifying Alternative Sources
6. Improving The U.S. Military Industrial Base

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USSOCOM CTO DACP & FCT Proposal Process



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FY07 Approved CTO Projects

- Defense Acquisition Challenge
  - Modular Composite Armor Kits ($2.4M)
  - Lithium Ion Battery For Seal Delivery Vehicle ($1.8M)
  - Improved Radio Frequency Micro-Chip Assemblies ($1.0M)
  - Crew Served Heavy Weapons Aiming Laser ($ .3M)

- Foreign Comparative Testing
  - Hostile Forces Tagging, Tracking, & Locating ($ .9M)
  - Anti-Materiel Rifle ($ .9M)
  - MK47 Crew-Served Weapon Trainer ($1.3M)
  - PSYOP Radio Broadcast Platform ($1.4M)
  - Lightweight Deployable Universal Communications System ($1.1M)

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Who To Contact

- Mr. Ron Schwartz, (813) 826-8985
  - schwarr@socom.mil
- Mr. Charlie Snellgrove, (813) 281-0560, X729
  - Charles.Snellgrove.Ctr@socom.mil
- Mr. Jim Santalucia, (813) 281-0560 X511
  - James.Santalucia.Ctr@socom.mil
- CTO Homepage: http://www.acq.osd.mil/cto
- Proposal Submissions: https://cto.acqcenter.com/osd/portal.nsf

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Special Operations Special Technology

Distribution Statement A: Approved For Public Release; Distribution Unlimited

Capabilities Based Analysis

- Organized Process By Which Current Capability Gaps And Future Requirements Are Used To Focus The Technology Development And Materiel Acquisition Efforts

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USSOCOM Capabilities Gap Analysis

- High Priority Technology Cross Threads
  - Signature Management
  - Power And Energy
  - Command, Control, Communications, And Computers

- Capability Areas
  - Tagging, Tracking And Locating (TTL)
  - Intelligence
  - SOF Warrior (Small Arms)
  - Mobility
  - Information Operations & Psychological Operations
  - Sensors
  - Command And Control
  - Fire Support (Heavy Weapons)
  - Training Systems
  - Logistics
  - Medical

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USSOCOM Technologies Of Interest

- New And Combined Weapon Accessory Capabilities
- Miniaturized / Power-Efficient Gun Lights
- Militarized Green-Light Lasers
- Miniaturized Sound, Flash, And Signature Suppression
- Miniature Red-Dot Sights
- Sights With Integral Or Modular Range Finding/Ballistic Solutions
- New Image Intensification, Thermal, And Sensor Fusion Clip-on Sights
- Grenade Launcher Sights
- Crew-Served Weapons Accessories, Mounts, And Armor Shields
- Militarized Video Flat-Panel Displays

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How To Get Funding To Develop The Technology

- USSOCOM Focus Is On Near Term Support To Warfighters So Most Programs Are Off The Shelf Or Near Off The Shelf And Very Few Are Funded From Technology Development.
- Source Selection Is By Standard Fair And Open Competition. Be Alert For Announcements And Be Responsive In Your Proposals.
- Small Businesses Seeking Technology Development Funding Can Participate In The Small Business Innovative Research Program (SBIR)

- For More Information, Contact:
  - David Saren (813) 826-9363
    sarend@socom.mil

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Small Business Innovation Research (SBIR)

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SBIR Objectives

- Stimulate Technological Innovation
- Use Small Business To Meet Federal R&D Needs
- Foster And Encourage Participation By Minorities, Disadvantaged Persons, And Women In Technological Innovation
- Increase Private-Sector Commercialization Innovations Derived From Federal R&D

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USSOCOM SBIR Process

- Topic Call / Topic Selection (Component R&D And Acquisition Managers)
- Acquisition Program Executive Officer Approval
- DDR&E Approval
- All Questions Go Through SITIS
- Electronic Proposal Submittal
- Technical Evaluation
- Contract Award And Oversight

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SBIR Funding Process

- Budget $1M Per Topic
  - Phase I Awards
    - Feasibility Studies (6-9 Months In Duration)
    - Multiple Contract Awards (<$70K With A <$30K Option)
  - Phase II Award
    - Principal R&D Effort That Produces A Well Defined Product Or Process (Approximately 2 Years)
    - Non-Competitive Contract Award(s) To Successful Phase I Offerors (<$750K)
- Assist Firms With Transition From Phase II To Phase III
- Highest Transition Rate In DOD

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2008.1 SBIR Solicitation

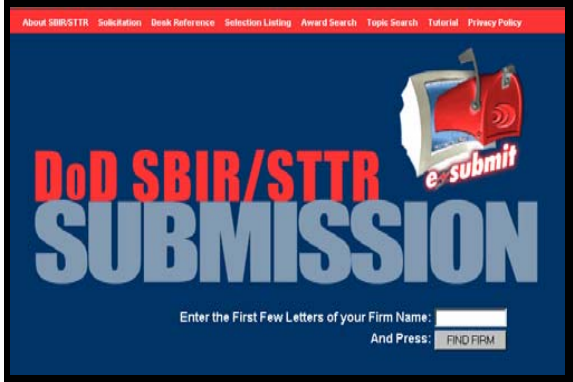
- USSOCOM R&D Topics Release Date: 6 Nov 2007*
- Open Solicitations:
  - 6 Dec 2007: Beginning Date For Accepting Proposals*
  - 10 Jan 2008: Close-Out Date For Submission Of Proposals*

* Dates May Be Subject To Change

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DoD Web-Based Proposal Submission





- All PHASE I & II Proposals Must Be Submitted Electronically Via Web Site

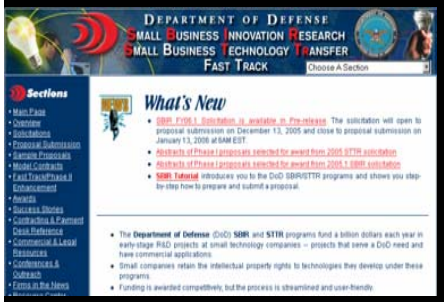
http://www.dodsbir.net

http://www.dodsbir.net/submission

- Web Site Includes A Variety Of Locations For Assistance In Preparing And Submitting Proposals

Distribution Statement A: Approved For Public Release; Distribution Unlimited

Contact Information



- SBIR Program Manager
  Shawn Martin
  shawn.martin@socom.mil

http://www.acq.osd.mil/osbp/sbir



- Deputy Director,
  Small Business Programs
  Karen Pera
  karen.pera@socom.mil

http://soal.socom.mil



- SBIR Program Coordinator, NSWC Crane
  Mary Motyka
  mary.motyka@navy.mil

http://www.crane.navy.mil/acquisition/smbussbr.htm

Harnessing the Power of Technology for the Warfighter

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"You Have A New Idea"

- You Have Invented A New Paradigm Shifting, Overmatching, Revolutionary, Transformational Capability That Weighs Nothing, Costs Nothing, And Never Breaks.

- Contact The USSOCOM Technical Industrial Liaison Office For An Appointment To Brief Our Technology, Requirements, And Acquisition Team.

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Who & What Is A TILO

- **(U) Technical Industrial Liaison Officer**
  - Mr. David J. Johnson Is The Initial And Primary POC For All Wishing To Do Business With USSOCOM
  - Single Entry And Exit Point
  - Arranges And Attends All Meetings With GO/FO/SES Level Officials
  - Contact Information
    - (813) 828-9482
    - tilo@socom.mil
    - Fax: (813) 828-9488
- (U) Staffs Information Across USSOCOM
  - White Papers
  - Company Information
- (U) Responds Back To Industry On Meetings And Opportunities
- (U) Interfaces With Industry
  - Identify A USSOCOM Sponsor
  - Schedule Briefings With The Sponsor

Distribution Statement A: Approved For Public Release; Distribution Unlimited

What We Need

- (U) You Provide
  - Firm / Address / Phone / Email
  - Product/Service Description
  - Propose Dates Of Availability
  - Classified Or Unclassified Brief
  - Who You Recommend For Target Audience
  - What Type Of Support Needed
    - Audio/Visual
    - Computer And Software

Distribution Statement A: Approved For Public Release; Distribution Unlimited

How To Contact

- (U) Mail:
  - United States Special Operations Command
    Attn: SOAL-KB (TILO)
    7701 Tampa Point Blvd.
    MacDill AFB, FL 33621-5323

- (U) Fed Ex:
  - United States Special Operations Command
    SOAL-KB (Mr. David J. Johnson)
    Bldg. 306

- (U) Electronic:
  - tilo@socom.mil
  - http://soal.socom.mil

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SOF Weapons "Possible" Future Opportunities

Present "Spiral" Requirements

- Signature Suppression
  - MK46 (5.56x45MM)
  - MK48 (7.62x51MM)





  - Precision Sniper Rifle (Caliber 338) Suppressor

- Rifles
  - Anti Material Rifle

Harnessing the Power of Technology for the Warfighter

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SOF Weapons "Possible" Future Opportunities

Present "Spiral" Requirements (cont.):

- Ammunition
  - "Flashless"/Low Signature Ammunition
  - Caliber .338
  - Enhanced 40mm (Low/Medium Velocity) to 600M
  - Programmable 40MM (Low/Medium Velocity) Ammunition



- Sighting Systems
  - Ballistic Fire Control Solution For 40MM
- Combat Pistol
  - USSOCOM Revising Combat Pistol Requirement
  - Full And Open Competition/Product Samples
  - Create A Qualified Vendor List Of Pistols In Calibers 9MM, 40, And 45

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Summary

- Provided Information Relative To PEO-SW Product Areas
- Discussed Typical Acquisition Approach For SOF Weapons
- Relayed Information In Regards To ”How And Who To”
- Provided Areas Of Possible Future Business Opportunities

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Contact Information

Mr. Troy Smith
USSOCOM SOF Weapons Program Manager
NSWC Crane
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LTC Eric Glenn
Systems Acquisition Manager - Weapons
USSOCOM (PEO- SOF Warrior)
Commercial: 813-826-9422
Email: glenne@socom.mil

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Joint Services Small Arms Systems Annual Symposium

"Meeting the Needs of Our Joint Ground Forces in the Fight Against Terrorism"



Presented by

George W. Solhan

Deputy Chief of Naval Research for
Expeditionary Maneuver Warfare and
Combating Terrorism S&T Department (ONR 30)

8 May 2007















Revolutionary Research . . . Relevant Results

Technology is Dominant

Today, Marines and Sailors have at their disposal the world's most sophisticated military technology



Laser-Guided Munitions

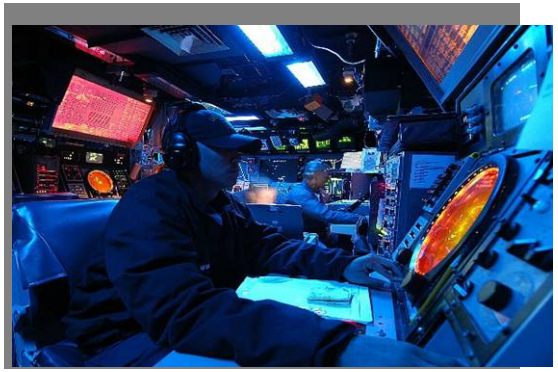




Mobile Communications



GPS Navigation and Targeting



Network-Centricity, Information Warfare, and Intelligence

Technological "Democratization"

Revolutionary Research . . . Relevant Results



Internet—Information Warfare and Intelligence

In the global war on terror and in Iraq, our adversaries are leveraging sophisticated technology that is now easily available anywhere in the world—and at a modest cost.





Cell Phones—Mobile Comms



Commercial Laser Rangefinder—Precise Targeting



Handheld GPS—Location with Extreme Accuracy

Revolutionary Research . . . Relevant Results

A Swiftly Changing Planet



- In an era of increasing globalization, new technology is more readily available—and more quickly—than ever before
- The natures of "combatant" and "weapon" are changing, and new challenges can come from anywhere in the world

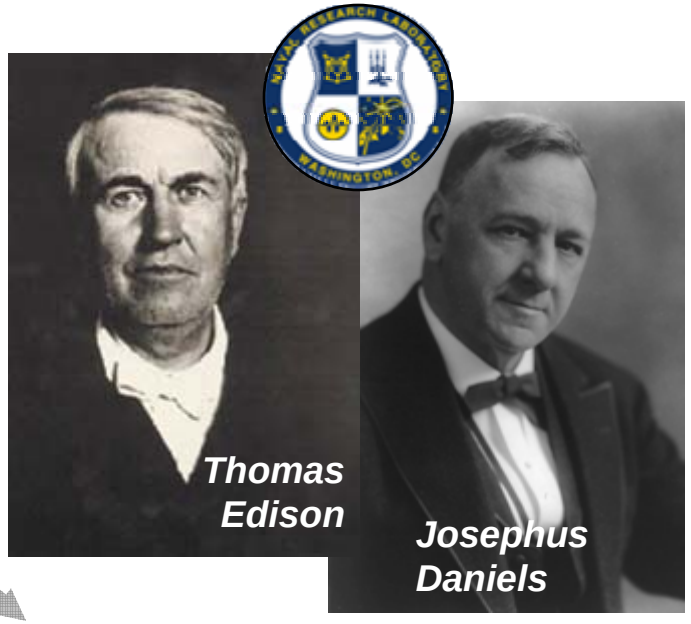
- We must accept the fact that adversaries will use our technology against us
- To stay competitive on tomorrow's battlefields, we must:
  - **Ensure** our people and research enterprises are more innovative
  - **Maintain** our technological advantage



Naval Research: A Statutory Mission

Naval Research Laboratory ***(Appropriations Act, 1916)*****:**
"[Conduct] exploratory and research work…necessary… for the benefit of Government service, including the construction, equipment, and operation of a laboratory…."

Office of Naval Research ***(Public Law 588, 1946)*****:**
"… plan, foster, and encourage scientific research in recognition of its paramount importance as related to the maintenance of future naval power, and the reservation of national security…. "





Transitioning S&T ***(Defense Authorization Act, 2001)*****:**
"…manage the Navy's basic, applied, and advanced research to foster transition from science and technology to higher levels of research, development, test, and evaluation."

ONR 30 Mission: Expeditionary Maneuver Warfare and Combating Terrorism

Office of Naval Research *(Public Law 588, 1946)*:
*"… **plan, foster, and encourage scientific research** in recognition of its paramount importance as related to the maintenance of **future naval power**, and the **preservation of national security**…. "*

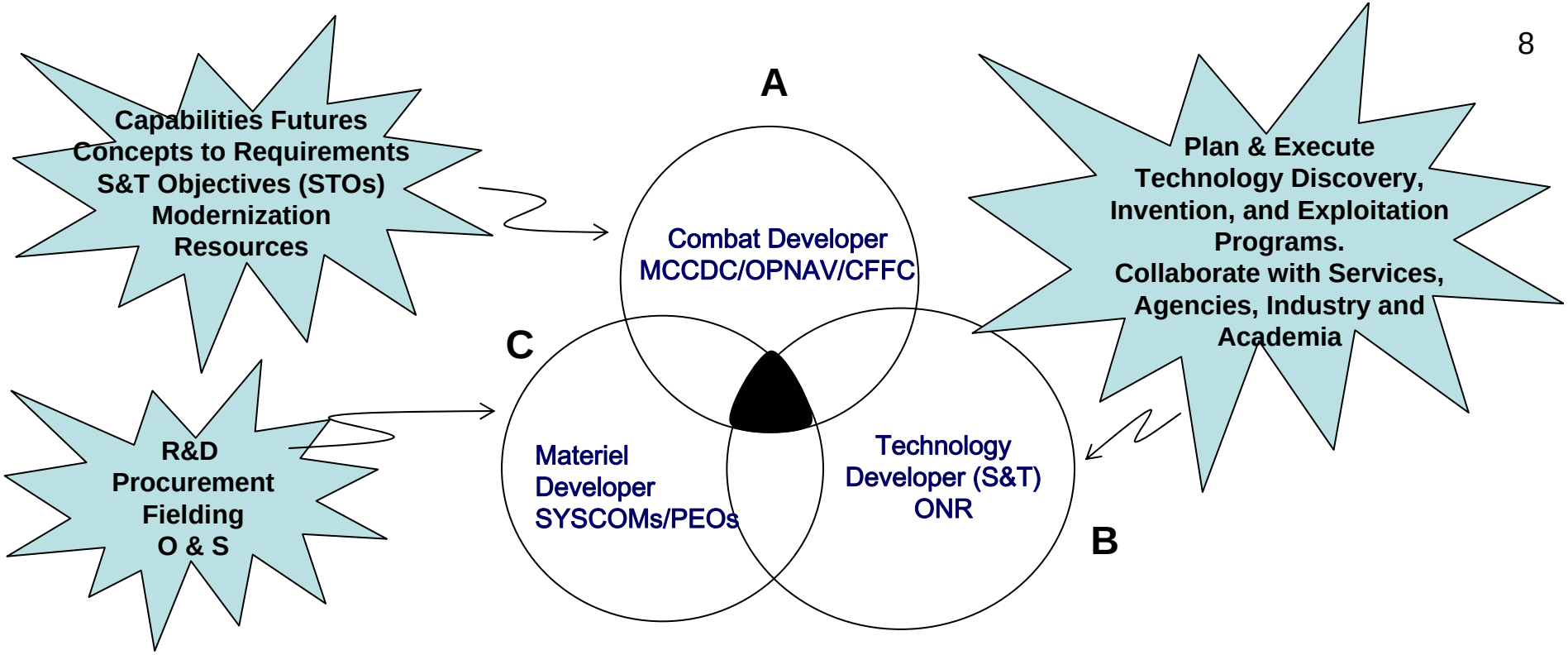
Expeditionary Maneuver Warfare and Combating Terrorism (Code 30)
*To lead the Department of the Navy's Science and Technology efforts that develop future **combat capabilities for Naval Expeditionary Maneuver Warfare and the Department's role in Combating Terrorism**:*

*…the exploitation and subsequent application of Science and Technology in order to enhance the ability of the **Navy-Marine Corps team to achieve assured access and conduct decisive operations as the naval portion of a joint campaign.***



Investment Thrust Areas:

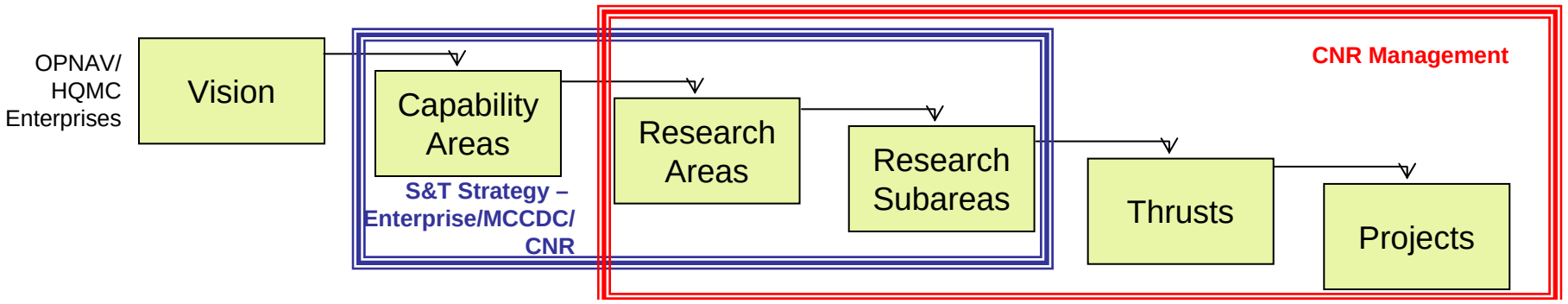
- **C4**
- **Fires**
- **Force Protection**
- **Human Performance**
- **Operational Adaptation**
- **Logistics**
- **Manuever**
- **Mine Countermeasures**
- **Maritime Irregular Warfare**



A Concept → Capability Futures → Gaps → Requirements

B Capability Futures → Gaps → Requirements → Technology

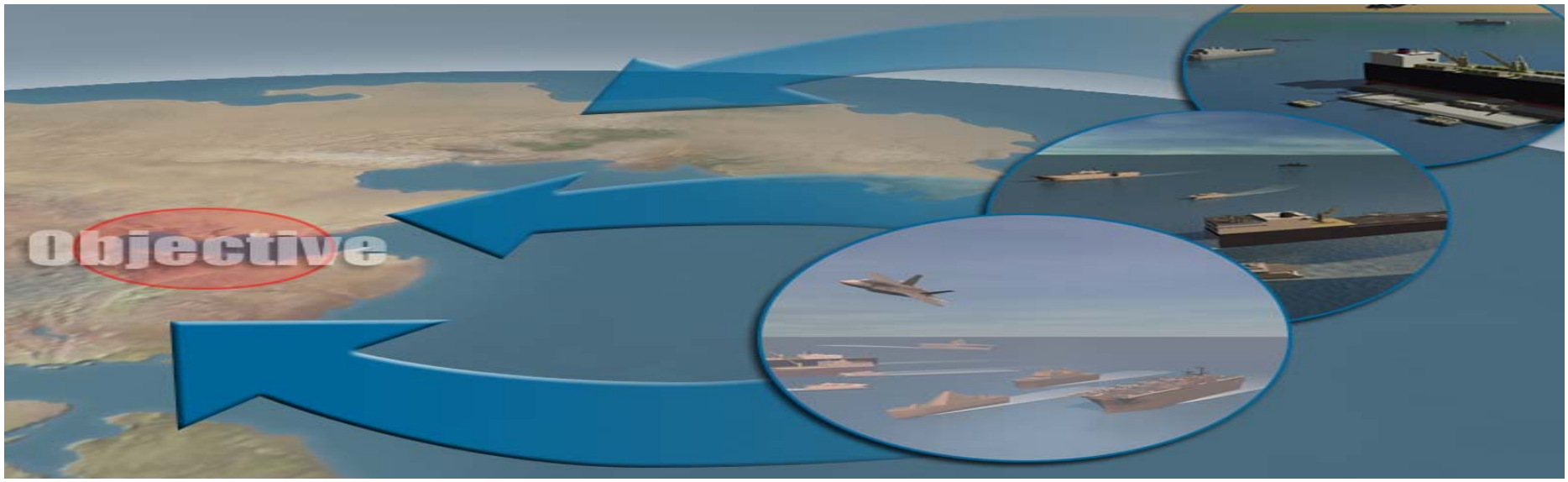
C Requirements → Technology → R&D/ Production → Capability



Revolutionary Research . . . Relevant Results

Distributed Operations (DO)

"***Maneuver Warfare** is the shift from quantitative characteristics of warfare – mass and volume – to qualitative factors of speed, stealth, precision, and sustainability*"



"***Distributed Operations** constitutes a form of Maneuver Warfare. The essence of this concept lies in the capacity for coordinated action by highly capable units, dispersed throughout the breadth and depth of the battlespace, ordered and **connected** within an operational design focused on a common aim."*

Distributed Operations

Vision: **Enable dispersed small units to dominate extended battlespace through advanced warfighter training, unambiguous situational awareness, robust communications and sense and respond logistics.**

Objectives

Training
- Enhancement of Physical and Cognitive Performance
- Simulation – based scenarios for enhanced training
- Rapid assimilation of cultural environments

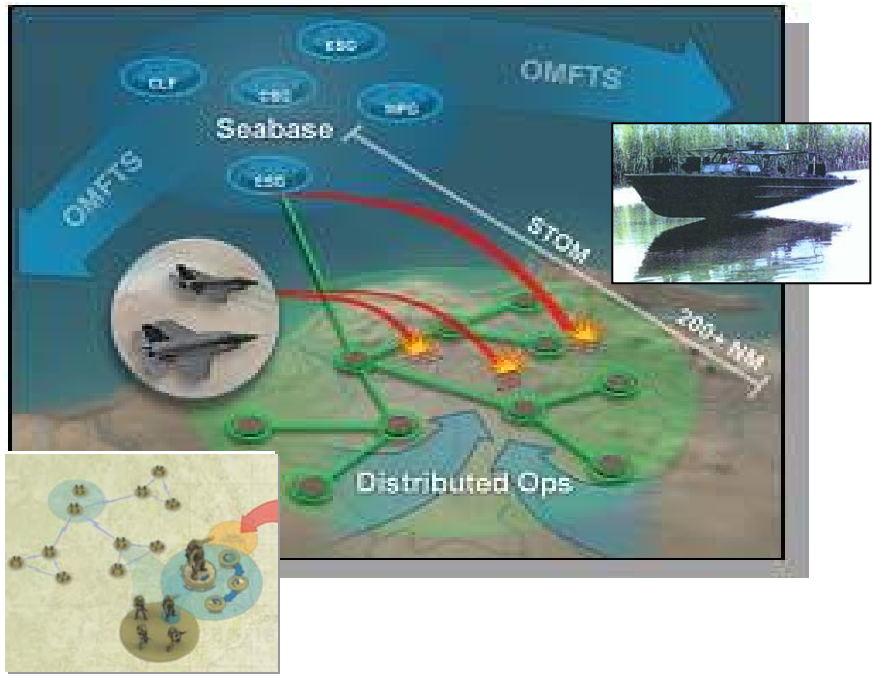
Communications
- Robust Command and Control networks
- Airborne relays on manned and unmanned platforms

Logistics
- Rapid re-supply and medical evacuation whenever possible
- Real–time automatic supply sensors and network
- Optimize medical self-sufficiency

Fires
- Integrate firepower of distributed ground, offshore, and air assets
- Blue Force Tracking down to the individual

Survivability
- Warfighter stealth technology
- Warfighter exoskeleton technology

Maneuver
- Adaptable and survivable tactical mobility systems to enhance operational tempo and extend range of vehicles and soldiers
- Advanced materials to reduce combat load



Key Research Topics

Training, Education & Human Performance
Expeditionary C4
Communications and Networks
Expeditionary Logistics
Expeditionary Firepower
Precision Strike
Expeditionary ISR
Unmanned Air and Ground Vehicles
Special Warfare / EOD
Land Mine Countermeasures
Expeditionary Maneuver/ Individual Mobility

Revolutionary Research . . . Relevant Results

HPT&E S&T Enables DO Excellence

- DO Marine as a system
- Information exploitation at all echelons in real time
- Enhanced combat capabilities at individual & small unit level
- DO-enabled training technologies & methodologies

Human Performance

Closing capability gaps in how individuals & teams of Marines perform, survive & excel in complex, DO environments via:

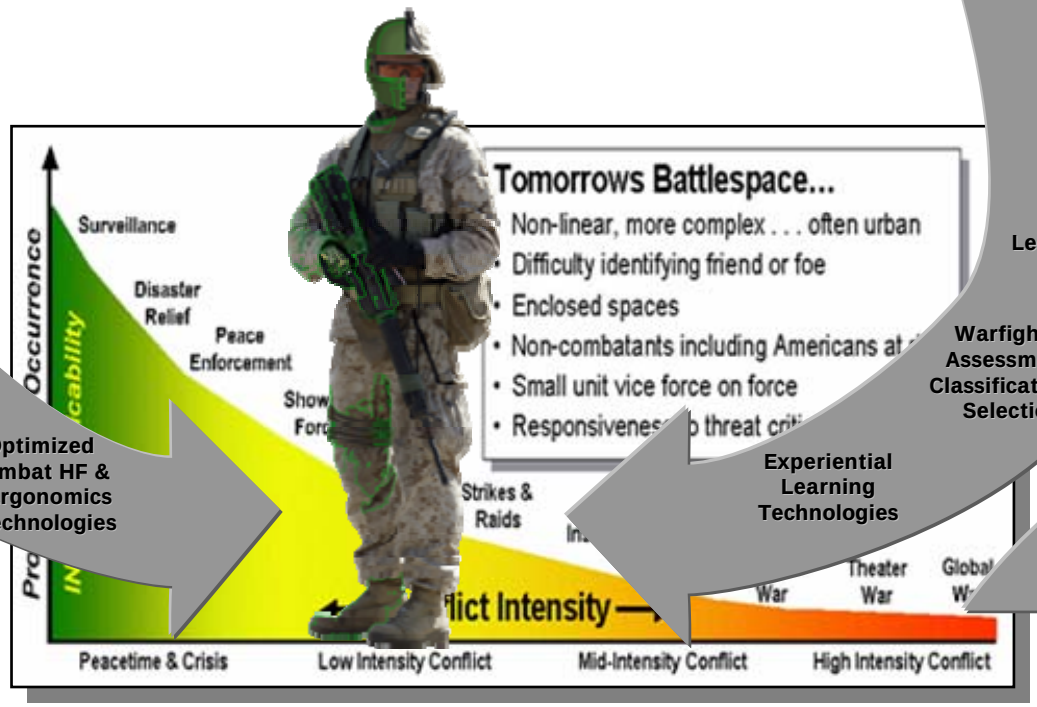
- Optimized Warfighter Cognition
- Optimized Warfighter Physiology
- Optimized Combat HF & Ergonomics Technologies

Leverage:

DARPA, SSC-SD, NHRC, Natick, USARIEM, PSE, NRL, RDECOM, MARCORSYSCOM

Goal: USMC technological superiority in all combat conditions

"Our most effective weapon remains the individual Marine who out-learns, out-thinks, and out-fights any adversary" -- CMC



Training & Education

Closing capability gaps in how Marines learn, train for, & think in complex, DO environments via:

- Accelerated Learning Science
- Warfighter Assessment, Classification & Selection
- Experiential Learning Technologies

Leverage:

DARPA, TECOM, TRASYS, NPS, DI, NRL, Clemson, UCF-IST, FAU, EGI, Sarnoff

Revolutionary Research . . . Relevant Results

The Ultimate Customer – The Warfighter!

Caveat: Real Customer: SYSCOMs, PEOs, DRPMs

HOT Buttons:

1. **Survivability**
2. **Reduce Combat Load**
3. **Small Unit Excellence**
4. **Fuel Efficiency**
5. **Light weight portable power sources**
6. **“Transparent” Urban Structures**
7. **Modular, Scaleable Weapons**
8. **CIED, MCM, CRAM**
9. **Operational Adaptation**
10. **Infantry combat load reduction**



Revolutionary Research . . . Relevant Results

F-22 Raptor vs "The Grunt"





Cost	$120M	per aircraft
	$200K	pilot's training
	$87K	pilot Salary
	$12K	1 hour flight time

Cost	($500K	SGLI)
	$20K	PFC Salary
	$10K	Training
	$3.5K	Equipment

Limiting factor for Grunts should not be $

Do we really think they have enough effective, lightweight, relevant equipment?

Revolutionary Research . . . Relevant Results

Lighten the Load

Yesterday's & Today's Marine – Overloaded!

1960s



Today



No Change

Treat the Marine as a system – Focus on the entire individual

~Make smart tradeoffs between performance & weight~

Improvements in:

- Combat Load
- Ergonomics
- Nutrition
- Physiologic Performance (Endurance, Strength)
- Fatigue Management
- Protection

Tomorrow's Marine: Optimized for Combat Endurance

Equals improvements in a Marine's load-bearing capability

Revolutionary Research . . . Relevant Results

Challenges for the Future

- Improved sensing / identification of targets in the urban environment….”Transparent Urban Structures”.
- PID targets at greater ranges + ability to engage at greater range.
- “Precision strike” capabilities in small arms.
- Increased lethality or lower “specific volume / weight”.
- Reduced overall logistics overhead (from the factory/depot to the theater of operations; to the field; to the customer (grunt)).
- More electrically/thermally efficient electronic gear to reduce demands on portable power.
- Training – think about the “Strategic Corporal.”

Revolutionary Research . . . Relevant Results

Conclusions

- Rapidly changing global technology is creating problems—as well as opportunities—for today's expeditionary warfighter
- We must be flexible enough to solve today's critical challenges while focusing on tomorrow and the Army, Navy and Marine Corps after Next
- Break Industrial Revolution mindset; commit to exploring disruptive technologies. Stable funding for JSSAP for "the Grunt after next."
- Money tree will eventually stop growing – industry must adapt to make cheaper, lighter, lower power, even more effective systems



Revolutionary Research . . . Relevant Results

QUESTIONS?



JNLWP Update to the Joint Service Small Arms Symposium



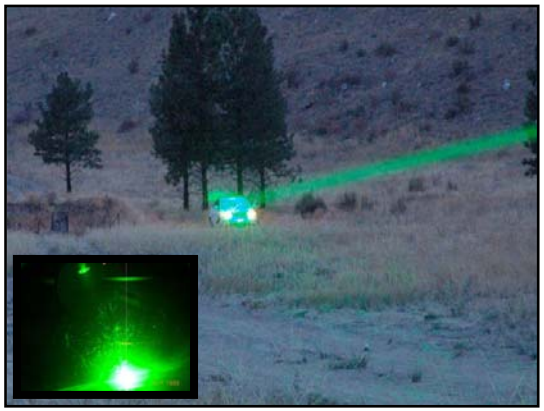
Mr Swenson
Acquisition Division Chief, Joint NL Weapons Directorate
(703)432-0906, DSN 378-0906
kevin.swenson@usmc.mil

8 May 07

Distribution Statement A – Approved for Public Release

Service Requirements

1. Stop / Disable / Impede Vehicles / Vessels
2. Crowd Dispersal / Temporarily Incapacitate Individuals
   - On Land or In the Water @ 300 Meters
3. Clear Facilities With and Without Entering
4. Deny Area / Deny Access
5. Determine Intent







Recommendations

Focus on the Payload, Not the Launching Platform
Range Similar to Small Arms Lethal Ammunition
Fire From Existing Platforms
Increasing Focus on MOUT Operations / Requirement's
Service Desires for "Scaleable" Weapons
Increase NLW/C Education / Training
- Get NLW/C Into Senior Level PME
  - Officer and NCO Curriculums
- Include in Escalation of Force (EoF) Training / Orders
- More MTT's for Deploying Forces

JNLWP Small Arms Interface



M79, M203 & XM320



Airburst NL Munitions (USA)







MK19 NL Munition (USA)



Venom



66mm VL NLG's

Mission Payload Module (USMC)





Washable Paint

Permanent Paint

CS-type 1

FN-303 Projectile Launcher (USA)







Joint NL Warning Munitions (USN)



X26 Taser ® (USA)

Joint Integration Program (JIP)

Description:

A Forum established to Coordinate a Comprehensive Program that Maintains State-of-the-Art NLCS for each Service through Product Demonstrations, Sharing Lessons Learned and Evaluating COTS Products for Potential Inclusion into Service NLCSs.

Accomplishments since the Last JCIG Meeting:

- Last Semi-Annual JIP Meeting @ Ft. Irwin, CA (Jan 07)
- Next Meeting – 26-27 Sep @ NSWC Crane, IN
- AFOTEC Taser / OC Spray Evaluation Report is Complete

FY07 Projects:

- Evaluate Re-usable 40mm Training Rounds (USA)
- Evaluate Portable Entanglement Device (USCG)
- Launch cup w/ Adapters for two Shotguns and User Evaluation (USAF)

Future Activities:

- Finalize Charter & MOA (JCIG Signatures Required)
- Dates for Next Semi-Annual Meeting (June-Aug 2007 @ NSWC Crane, IN)

JNLWD Lead, USMC, USA, USN, USCG, USAF Voters and SOCOM Interest

Funding – FY07 - $800K**, FY08-FY13** - $800K / Year (Proposed)

Industry Contact – **Doug Esposito, American Systems**

douglas.esposito@americansystems.com

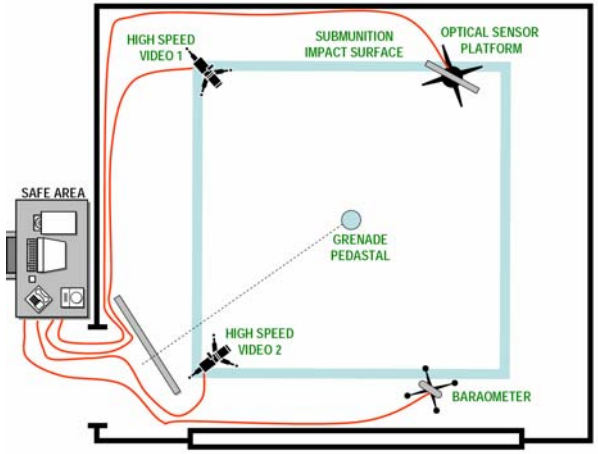


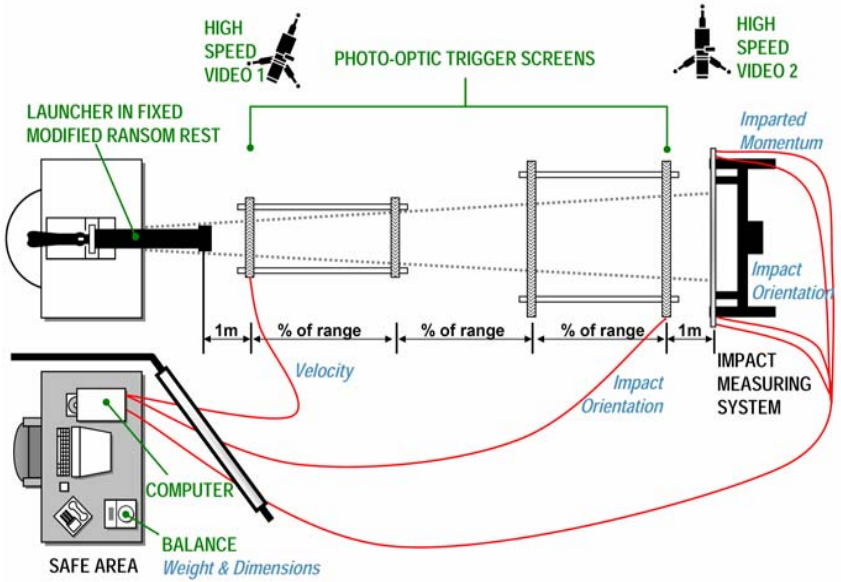




NL Munitions Characterization

Market Survey / Request For Information
Acquire Statistically Significant Quantities
Munitions / Grenade Characterization
Data Reduction
ATBM Run
Report Development
Industry Feedback



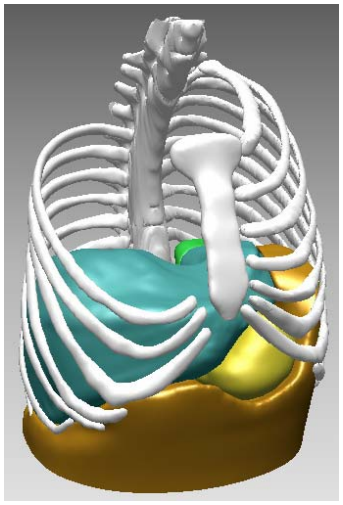


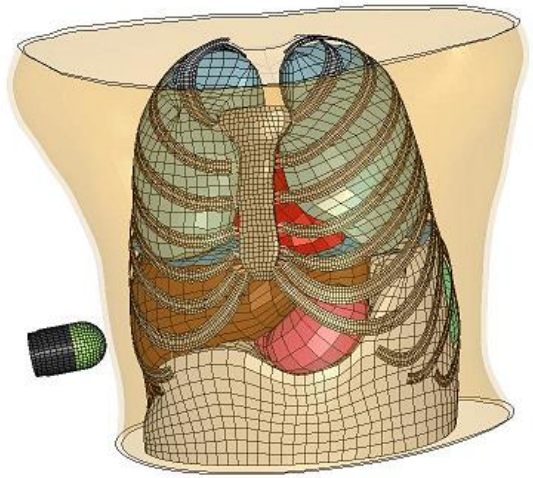
POC: Ed Hughes, Penn State University,
elh5@only.arl.psu.edu

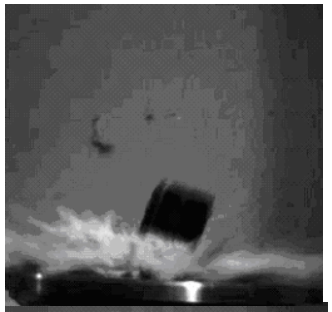
Advanced Total Body Model (ATBM)

- ATBM is a JNLWP sponsored finite element based blunt trauma injury prediction model
- Biomechanically based, applicable for NLW impacts and validated against animal and cadaveric data
- Predicts a variety of injuries for the head, neck, thorax, abdomen, skin and extremities
- Includes design optimization and probability of hit modules
- Established projectile characterization process including static and dynamic loading to develop projectile FE model

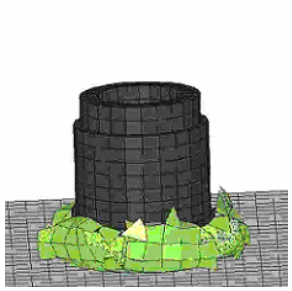
Jim Simonds
james.simonds@brooks.af.mil

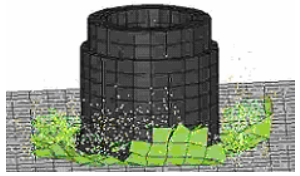


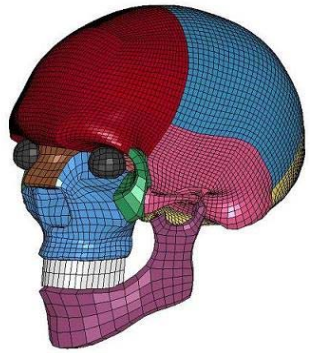












JNLWP Education Opportunities

- **EDUCATION**
  - **Pennsylvania State University on-line course: NON-LETHAL WEAPONS: POLICIES, PROCEDURES AND TECHNOLOGIES CERTIFICATE**
  - **www.fayette.psu.edu/ccps – application form available online**
  - **JNLWD Point of Contact – LCDR (USN) Cabot Aycock, cabot.aycock@usmc.mil**

- **WEBSITE – https:/www.jnlwp.com**

  JNLWD Point of Contact – Elsie Hasting

  elsie.hasting.ctr@usmc.mil



Marine Corps Weapons

Infantry Automatic Rifle (IAR)



Joint Program: No
Lead Agency: USMC

Program Description:
•Milestone A Decision in Feb 06.

Projected Activities:
•Prototype contract award 1 Jun 06 (3 contractors).
- •Fabrique National - Herstal
- •General Dynamics ATP

•Prototypes Delivered 1 Oct 06.
•Prototypes Tested 1 – 31 Oct 06.
•Milestone B Decision in Jun 07.
•Initial Operational Capability (IOC), 1st quarter FY 09.
•Full Operational Capability (FOC), 3rd quarter FY 10.

Mission: Provide the Marine automatic rifleman with enhanced maneuverability and displacement speed, as well as the ability to suppress or destroy both point and area targets.

System Description
The Infantry Automatic Rifle (IAR) will be a magazine-fed, 5.56mm weapon that increases the automatic rifleman's maneuverability and displacement speed, allowing him to keep pace with the rest of the fire team. This program responds to a Universal Needs Statement (UNS) submitted in November 2001 that identified the need for an automatic rifle to replace the Squad Automatic Weapon (SAW) within the infantry. The IAR will be designed for optimal operation by a single Marine and possess increased accuracy and reliability over the M249 SAW.

Weight: TBD
Length: TBD
Caliber: 5.56 mm

Integrates with:
- •MIL-STD 1913 Accessory Rail

Potential Opportunities

- Reset The Force
  - Potential for assisting USMC in rebuilding current assets coming out of theater.
  - Long Range Sniper System
  - Foreign Weapons
  - Emerging requirements

General Discussion

- Current account of weapons proven to be combat worthy
- Continuously looking to improve the current small arms inventory
  - Lots of interest in reducing weapons signature
  - Focus for the next few years will be the sustainment of current weapon set and the reset of the force
  - The Marine Corps supports the Air Force personal weapon program
- Over the next eight years the Marine Corps will examine weapons accuracy, weapons performance and the need for improved penetration of barriers
  - The Marine Corps will evaluate alternatives to the current 5.56mm NATO rounds
  - If through evaluation, a need for increased caliber agility exists then a Service Rifle Replacement program may be necessary

NSWC Crane

"Harnessing the Power of Technology for the Warfighter"

Distribution Statement A - Approved for public release; distribution unlimited.

Miniature Red Dot Sight

8 May 2007

Presented by Mr. Rick Tousignant,
MRD Project Manager



Distribution Statement A - Approved for public release; distribution unlimited.



Presented to NDIA Small Arms Symposium

Distribution Statement A - Approved for public release; distribution unlimited.

MRD-PIP Purpose

Distribution Statement A - Approved for public release; distribution unlimited.

MRD-PIP Purpose

Requirement: The MRD-PIP system is intended to improve and standardize existing small COTS “mini” red dot products for SOF use.

MRD Mission: The MRD-PIP is intended to provide a primary day & low light close quarters battle capability when used in conjunction with “non-CQB” magnified optics (ACOG, Sniper Rifles, etc.) and sights equipped with iron sights only.

Distribution Statement A - Approved for public release; distribution unlimited.

MRD-PIP Purpose

Maturity of Technology: The MRD-PIP is an acquisition project. This project does not seek to conduct basic research, develop the technology base, or explore preliminary concepts that require long periods of research and development. Instead, this project effort seeks to rapidly develop, test, and field a system in a timeframe relevant to current conflicts. This project seeks development efforts that are based on commercial-off-the-shelf (COTS) and non-developmental items (NDI) that require only minor System Development and Demonstration, such as system miniaturization, ergonomic improvements, and environmental hardening to become technically qualified and operationally suitable for combat. Products that do not reflect either working prototypes or commercial items with modifications are not acceptable.

Distribution Statement A - Approved for public release; distribution unlimited.

MRD-PIP Background

Distribution Statement A - Approved for public release; distribution unlimited.

MRD Background

- 1990's: A small reflex sight was mounted on a prototype ACOG
- Prior to 2000: Competition Shooters experiment with combination sights
- 2000: SOPMOD Experiments with Fabricated Prototype









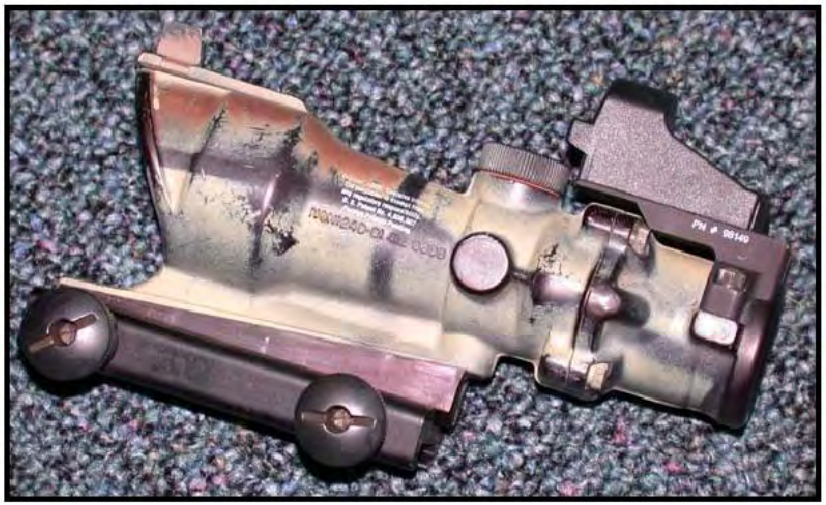
Distribution Statement A - Approved for public release; distribution unlimited.

MRD Background

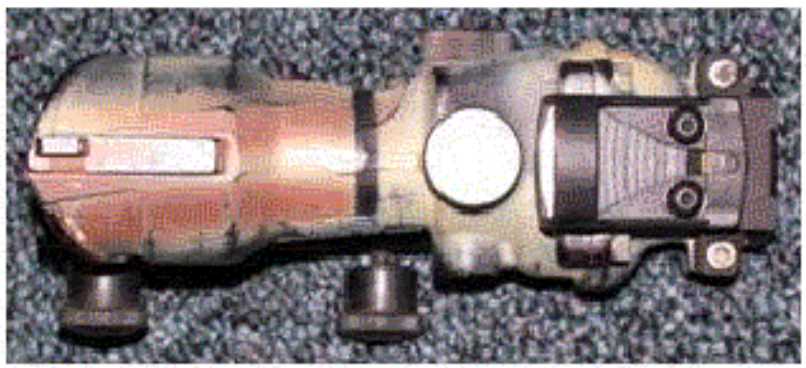
- Early 2002: Select SOF units experimented with MRD on SIG P226 slides with limited success.
- Mid 2002: Select SOF units made a 30mm Scope ring mount utilizing the MRD for Snipers.
- Mid 2002: ACOG mount prototype used with considerable success
- 2003: Commercial ACOG MRD Mount Introduced.
- 2005 – Current: Thousands Now Purchased, Thousands more in demand

Distribution Statement A - Approved for public release; distribution unlimited.

Common configuration ACOG 4X W/ MRD







Distribution Statement A - Approved for public release; distribution unlimited.

MRD Background





Common Configurations



Mk12 type scope.

Distribution Statement A - Approved for public release; distribution unlimited.

Issues

- Ruggedness
- Control of Red Dot
- Cover vs. On/Off Switch
- Ease of Adjustment
- Waterproofing
- Battery Change

Distribution Statement A - Approved for public release; distribution unlimited.

Issues

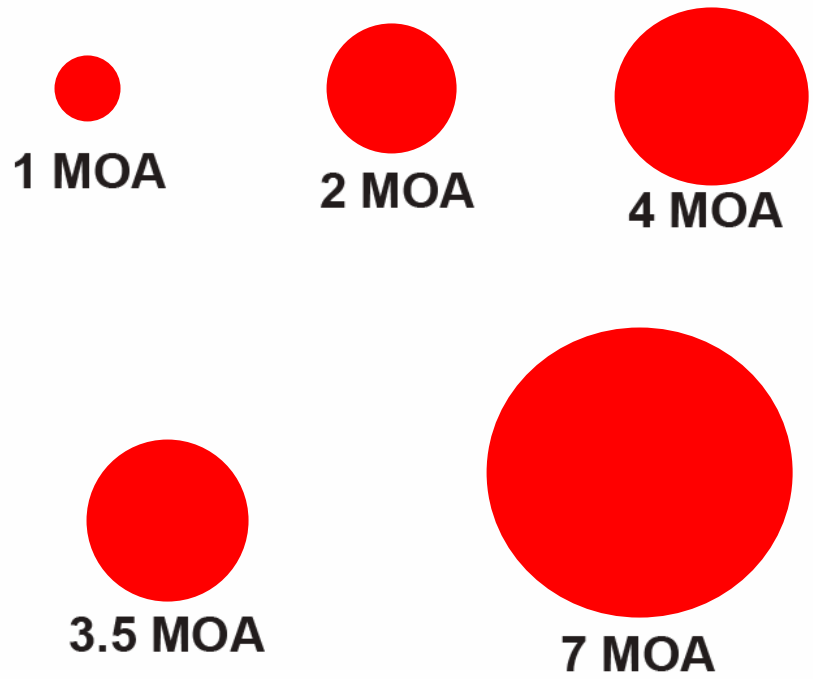
- ***Ruggedness***
- Control of Red Dot
- Cover vs. On/Off Switch
- Ease of Adjustment
- Waterproofing
- Battery Change



Distribution Statement A - Approved for public release; distribution unlimited.

Issues

- Ruggedness
- ***Control of Red Dot***
- Cover vs. On/Off Switch
- Ease of adjustment
- Waterproofing
- Battery Change

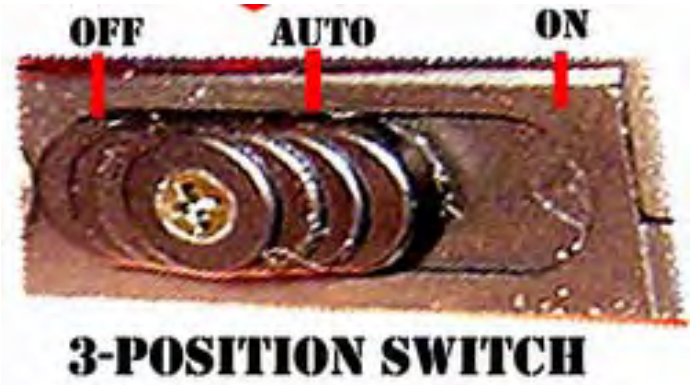


Distribution Statement A - Approved for public release; distribution unlimited.

Issues

- Ruggedness
- Control of Red Dot
- ***Cover vs. On/Off Switch***
- Ease of Adjustment
- Waterproofing
- Battery Replacement

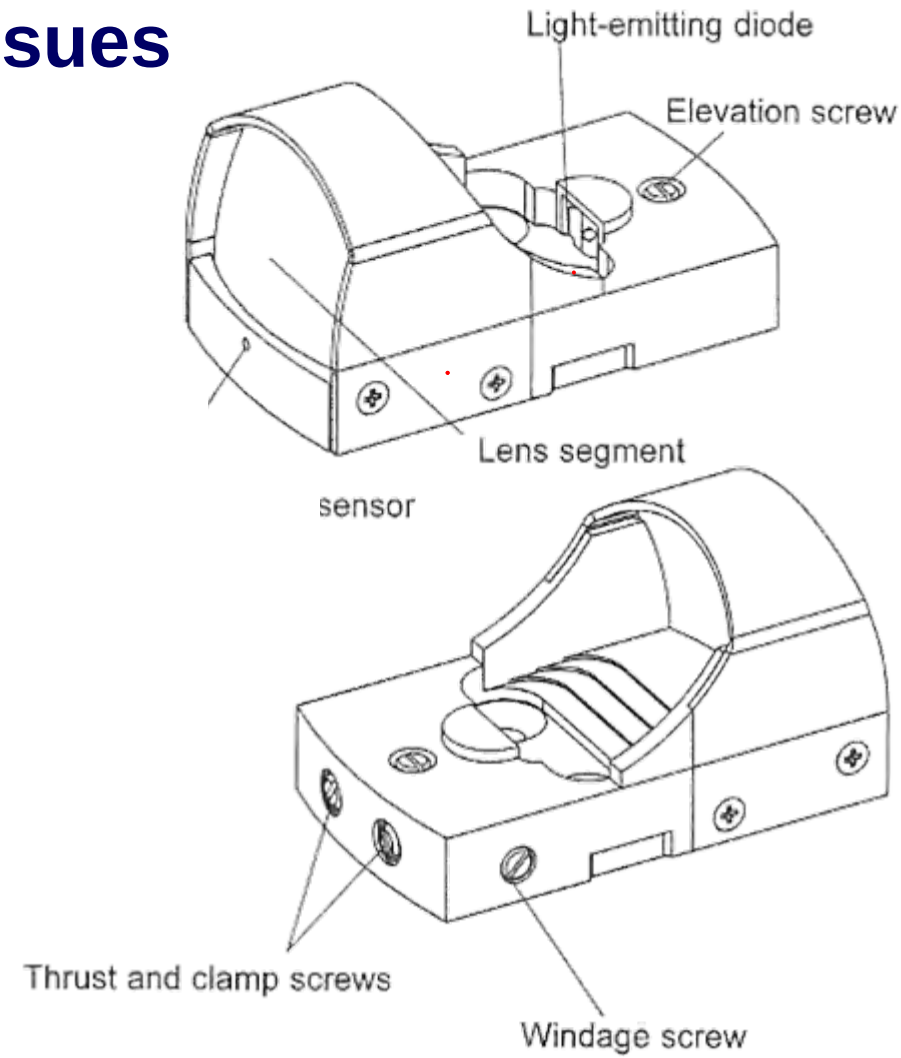




Distribution Statement A - Approved for public release; distribution unlimited.

Issues

- Ruggedness
- Control of Red Dot
- Cover vs. On/Off Switch
- ***Ease of Adjustment***
- Waterproofing
- Battery Replacement



Distribution Statement A - Approved for public release; distribution unlimited.

Issues

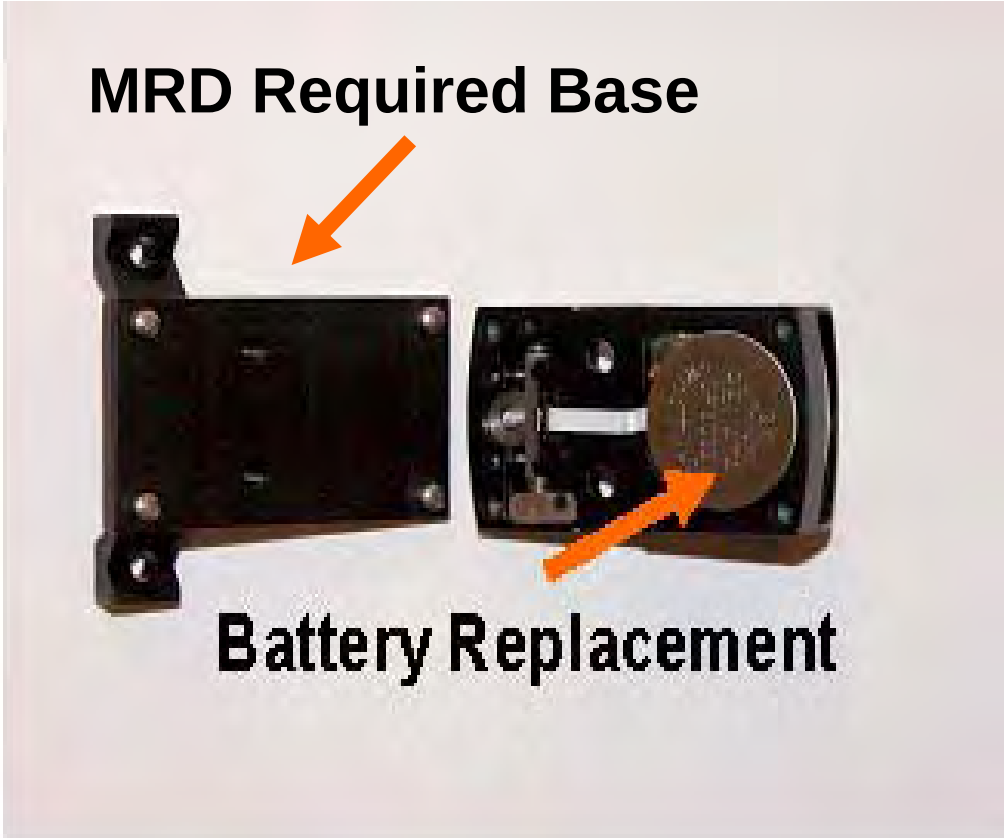
- Ruggedness
- Control of Red Dot
- Cover vs. On/Off Switch
- Ease of adjustment
- ***Waterproofing***
- Battery Replacement



Distribution Statement A - Approved for public release; distribution unlimited.

Issues

- Ruggedness
- Control of Red Dot
- Cover vs. On/Off Switc
- Ease of Adjustment
- Waterproofing
- ***Battery Replacement***



Distribution Statement A - Approved for public release; distribution unlimited.

MRD-PIP
(Host Sights)

- **THRESHOLD Sights**
  - **SU-230/PVS**
  - **SU-237/PVS**
  - **Legacy (NSN) ACOG 4X**
  - **AN/PVS-17A**

- **OBJECTIVE Sights**
  - **All Sniper Rifle Scopes**
  - **Future Clip-On Night Vision Devices**

Distribution Statement A - Approved for public release; distribution unlimited.

MRD-PIP
Host Weapons

- **THRESHOLD host weapons**
  - **M4A1 Carbine**
  - **M4A1 Carbine performing mated with the M203 Grenade Launcher**
  - **EX-16 SCAR Light, EX-16 w/EX-13 ELGM Attached**
  - **EX-17 Mod O SCAR Heavy, EX-17 w/ EX-13 ELGM Attached**
- **OBJECTIVE weapons**

M3 MAWS, M14 Rifle, AT4, AK 47, MK 11 Rifle, M40, 300 WinMag Sniper Rifle, MK 12 Rifle, M72 LAW, M2, M16 Series Rifle, M88 PIP Sniper Rifle, Remington 870 Series Shotgun, Mossberg 500 Series Shotgun, MK 46 LMG, MK 48 LMG, M240 MG, M249 MG, M60 MG, MK 43 MG, Mk 19 MG, and the M2 MG.

Distribution Statement A - Approved for public release; distribution unlimited.

MRD-PIP Acquisition Process and Schedule

Distribution Statement A - Approved for public release; distribution unlimited.

Acquisition Strategy

- Full, Fair and Open – Government/Industry Collaboration
- Developmental leading to Procurement
  - Independent Research and Development
  - Proposals Submitted Before Test Samples
  - 18 Test Samples per Proposal
  - One-Stage Down-select
  - Engineering Changes
  - Production
- Firm Fixed Price, Indefinite Delivery Indefinite Quantity
- "Best Value" Source Selection

Distribution Statement A - Approved for public release; distribution unlimited.

Source Selection Factors

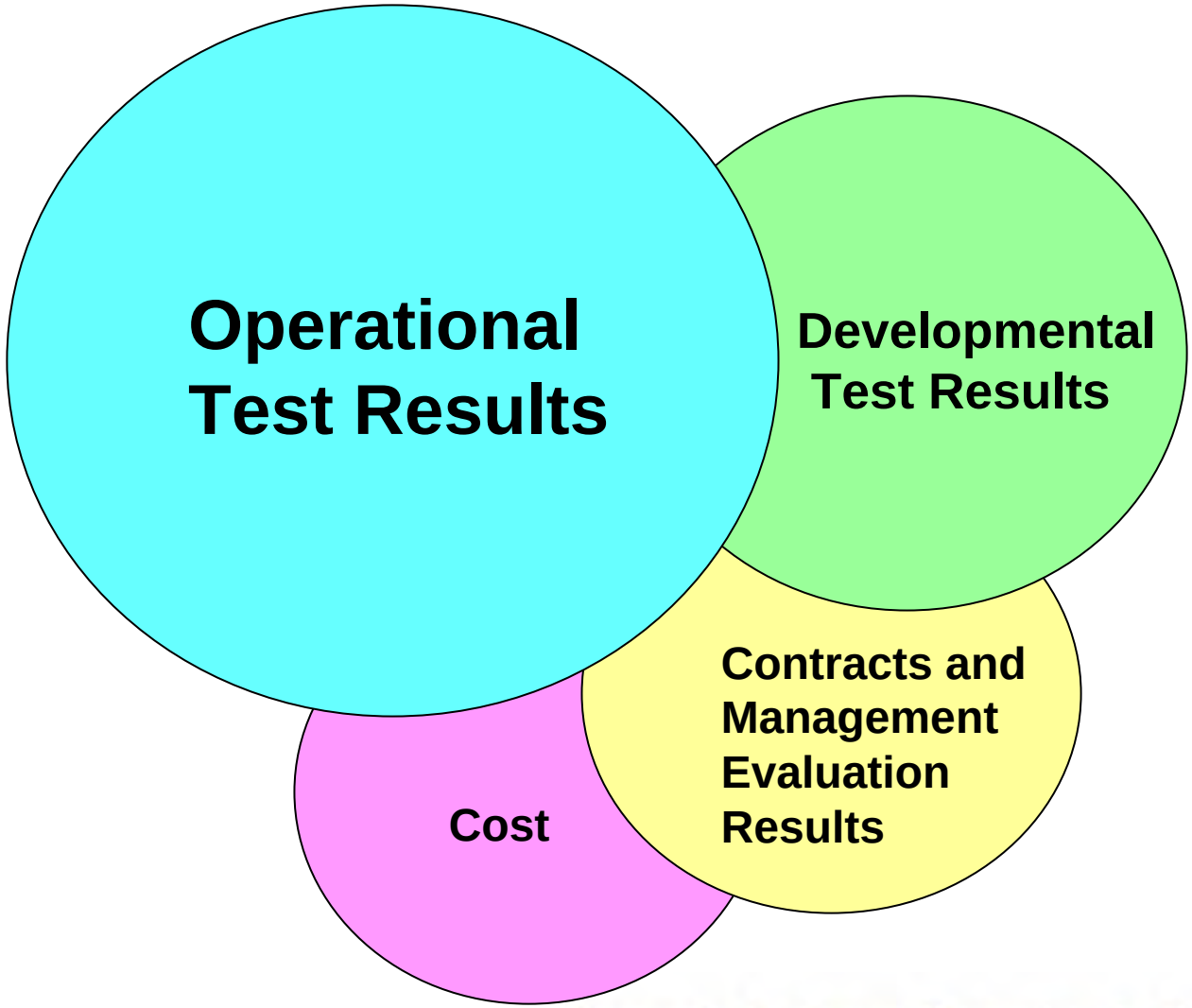
Probable Order of Importance

- **Technical**
  - **Operational**
  - **Developmental**
- **Contracting, Past Performance, and Management**
- **Price**

Solicitation is Governing Document!!!

Distribution Statement A - Approved for public release; distribution unlimited.

Source Selection Probable Importance

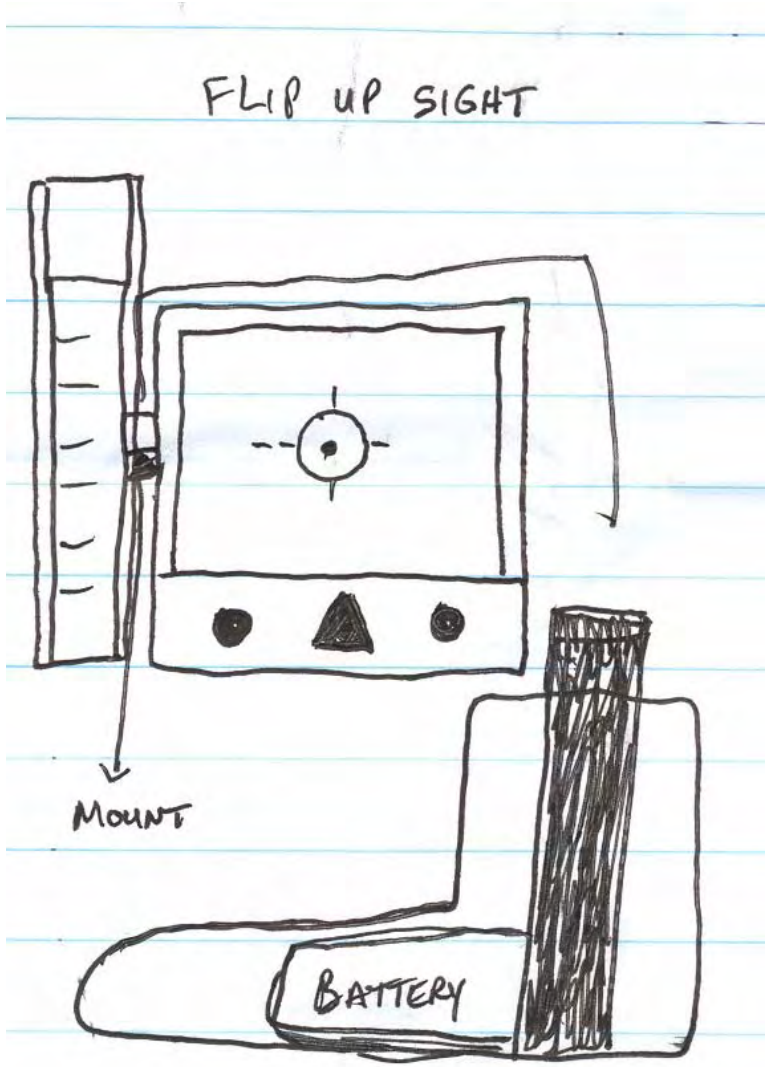


Distribution Statement A - Approved for public release; distribution unlimited.

Holographic Grenade Launcher Sight

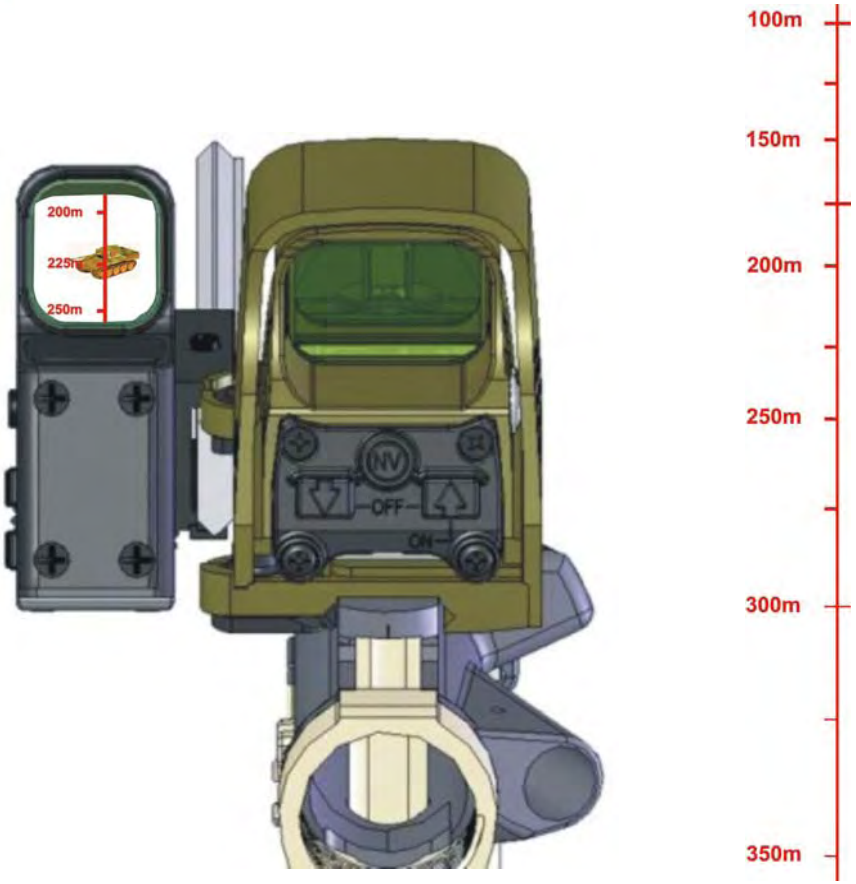
Distribution Statement A - Approved for public release; distribution unlimited.

Concept Drawing from User/Industry Conference January 2007



Distribution Statement A - Approved for public release; distribution unlimited.

Holographic Grenade Launcher



Holographic reticle projected to the target plane

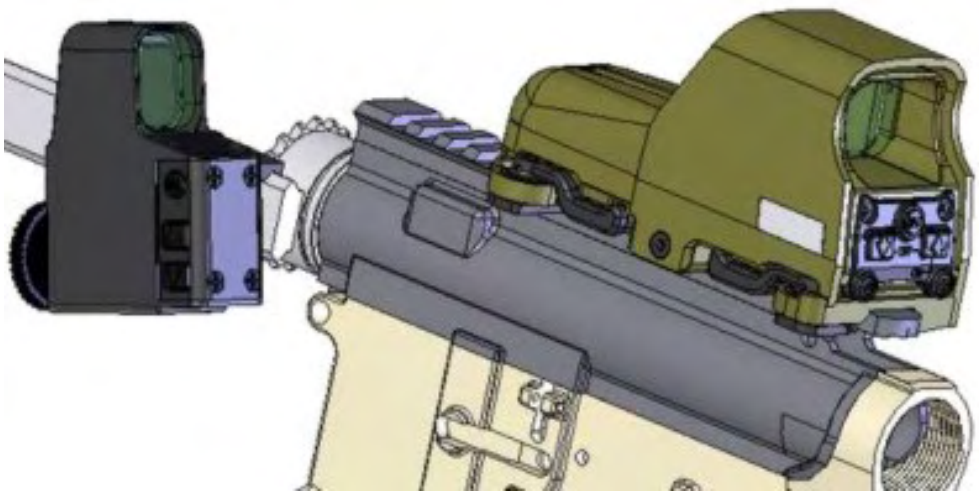
Holographic GL Sight

Concept Image Courtesy L-3 Communications EOTech, Inc. Ann Arbor, MI

Distribution Statement A - Approved for public release; distribution unlimited.

Holographic Grenade Launcher

GL Sight with
Inclinometer module





Mounting of Holographic GL sight

Concept Images Courtesy L-3 Communications EOTech, Inc. Ann Arbor, MI

Distribution Statement A - Approved for public release; distribution unlimited.

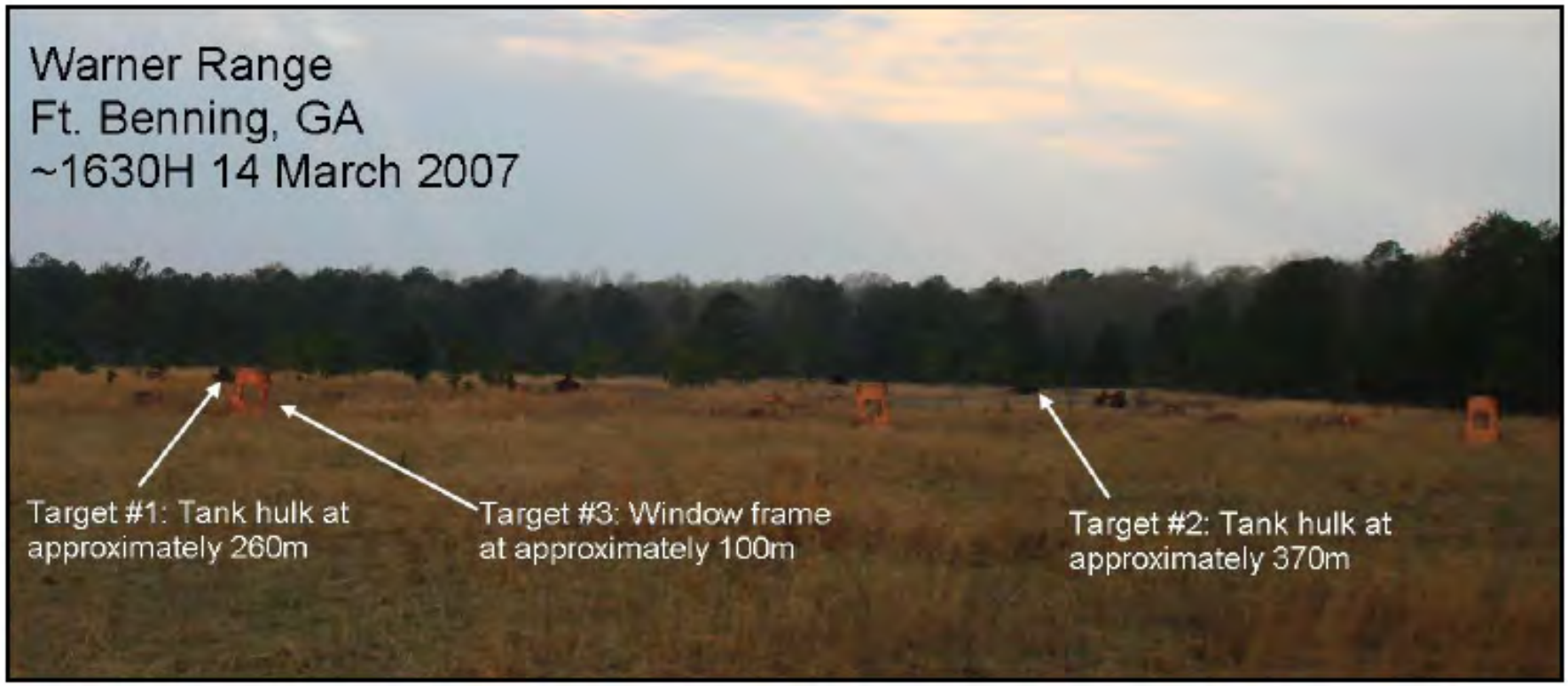
Holographic Grenade Launcher



Simulated View of holographic GL sight. Reticle is parallax-free. Eye position not important as long as reticle is visible within the window.

Distribution Statement A - Approved for public release; distribution unlimited.

M203 Holo Sight Design Team Familiarization



Distribution Statement A - Approved for public release; distribution unlimited.



Concept demonstration prototype fabricated with available parts

Distribution Statement A - Approved for public release; distribution unlimited.

The Holographic Grenade Launcher Sight with an inclinometer Module:

- Provides higher range resolution (<10m) when needed
- Can aim weapon by using the gun barrel to align weapon in azimuth and the inclinometer readout to set elevation angle
  - Allows indirect fire at hyper-elevation angles
  - Allows aiming in awkward position where the eye cannot be placed behind the aiming sight

Distribution Statement A - Approved for public release; distribution unlimited.

Rick Tousignant

Miniature Red Dot/Holographic Grenade Launcher Sight Project Manager

NSWC Crane

Commercial: (812) 854-5965, DSN 482-5965

Email: richard.tousignant@navy.mil

Distribution Statement A - Approved for public release; distribution unlimited.

NATIONAL SMALL ARMS TECHNOLOGY CONSORTIUM (NSATC)

MAY 9, 2007

PRESENTED BY

JEAN-LOUIS VANDERSTRAETEN

CHAIRMAN, EXECUTIVE COMMITTEE
NATIONAL SMALL ARMS TECHNOLOGY CONSORTIUM

OUTLINE

- **OVERVIEW**
- **MEMBERSHIP**
- **ELECTION OF EXECUTIVE COMMITTEE MEMBERS**
- **CENTER AND CONSORTIUM WEB SITE**
- **BUSINESS DEVELOPMENT**
- **BUSINESS DEVELOPMENT PROPOSALS**
- **PATH FORWARD**

OVERVIEW

- **VERY PRODUCTIVE FIRST FOUR MONTHS OF 2007**
  - **WORKED WITH GOVERNMENT TO DEVELOP AN ANNUAL PROCESS AND SCHEDULE OF EVENTS (SIX SIGMA PROJECT) FOR:**
    - **ARMY BUDGET AND PROGRAM OBJECTIVE MEMORANDUM (POM)**
    - **WHITE PAPERS**
    - **SOLICITATION FOR PROJECTS PROPOSALS**
    - **SUBMISSION OF PROJECT PROPOSALS**
  - **DEVELOPED SLATE OF NOMINEES FOR VACANT EXECUTIVE COMMITTEE POSITIONS**
  - **IMPROVED COMMUNICATIONS AMONG INDUSTRY EXECUTIVE COMMITTEE MEMBERS THROUGH ONCE A MONTH CONFERENCE CALL AND FACILITATOR**
  - **SUPPORTED JOINT SERVICE SMALL ARMS PROGRAM BUDGET ON CAPITOL HILL**

NATIONAL SMALL ARMS TECHNOLOGY CONSORTIUM

MEMBERSHIP STATUS

- **MEMBERSHIP KEEPS GROWING**
  - **TOTAL NUMBER OF MEMBERS** **76**
    - **INDUSTRY** **(71)**
    - **ACADEMIA** **(5)**
  - **NEW MEMBERS IN 2006** **14**
    - **INDUSTRY** **(11)**
    - **ACADEMIA** **(3)**
  - **FORECAST OF NEW MEMBERS FOR 2007** **15**
    - **2 APPROVED (INCLUDED IN 76)**
    - **4 IN PROCESS**
    - **9 ANTICIPATED**

NATIONAL SMALL ARMS CENTER AND NATIONAL SMALL ARMS TECHNOLOGY CONSORTIUM

WEB SITE

- **NEWLY REDESIGNED - IMPROVED**
- **ACCESSIBLE AND USER FRIENDLY**
- **ENABLES COMMUNICATION TO, FROM AND AMONG MEMBERS**
- **EASILY FIND WHAT YOU NEED WHEN YOU NEED IT**
- **VISIT US AT *www.nationalsmallarmscenter.org***
- **PROBLEMS – CALL OUR WEB MASTER "RICH" AT (763) 670-6106 OR E-MAIL HIM AT WEB SITE**

ELECTION OF EXECUTIVE COMMITTEE MEMBERS

- **EXECUTIVE COMMITTEE HAS 8 MEMBERS**
  - **7 INDUSTRY**
  - **1 ACADEMIA**

- **3 VACANCIES – ALL THREE YEAR TERMS**
  - **2 INDUSTRY**
  - **1 ACADEMIA**

- **SLATE OF NOMINEES HAS BEEN APPROVED BY THE EXECUTIVE COMMITTEE**
  - **C. REED KNIGHT, JR. - PRESIDENT AND CEO, KNIGHT'S ARMAMENT COMPANY**
  - **KARL LEWIS - PRESIDENT AND CEO LEWIS MACHINE & TOOL COMPANY**
  - **CHARLES POFF - PRESIDENT, AMERICAN ARMS AND ORDNANCE, INC.**
  - **CARL FRANTZ, DIRECTOR OF RESEARCH, UNIVERSITY OF LOUISIANA STATE AT LAFAYETTE (UNOPPOSED)**

- **SEND YOUR VOTES TO BARBARA BYRNES, EXECUTIVE DIRECTOR, NSATC, BY E-MAIL (*eme1bmt@aol.com*) NLT 15 MAY 2007**

BUSINESS DEVELOPMENT

- **CHAIRMAN, BUSINESS DEVELOPMENT COMMITTEE AND CONSORTIUM EXECUTIVE DIRECTOR**
  - **VISITED CAPITOL HILL IN FEBRUARY TO SUPPORT JSSAP FY08 BUDGET**
  - **ASKED FOR ADDITIONAL $5M ABOVE THE JSSAP REQUEST - $12.5M TOTAL**
  - **FUNDS ARE FOR**
    - **ADVANCED LETHAL ARMAMENT TECHNOLOGIES**
    - **ADVANCED FIRED CONTROL TECHNOLOGIES**
    - **NEW IDEAS FROM CONSORTIUM MEMBERS**
  - **GOT GOOD RECEPTION**
- **EXPECT TO VISIT CAPITAL HILL FOR BRIEFINGS TO CONGRESSIONAL STAFFERS AS A GROUP BEFORE THE APPROPRIATION BILL MARK-UPS BEGIN**

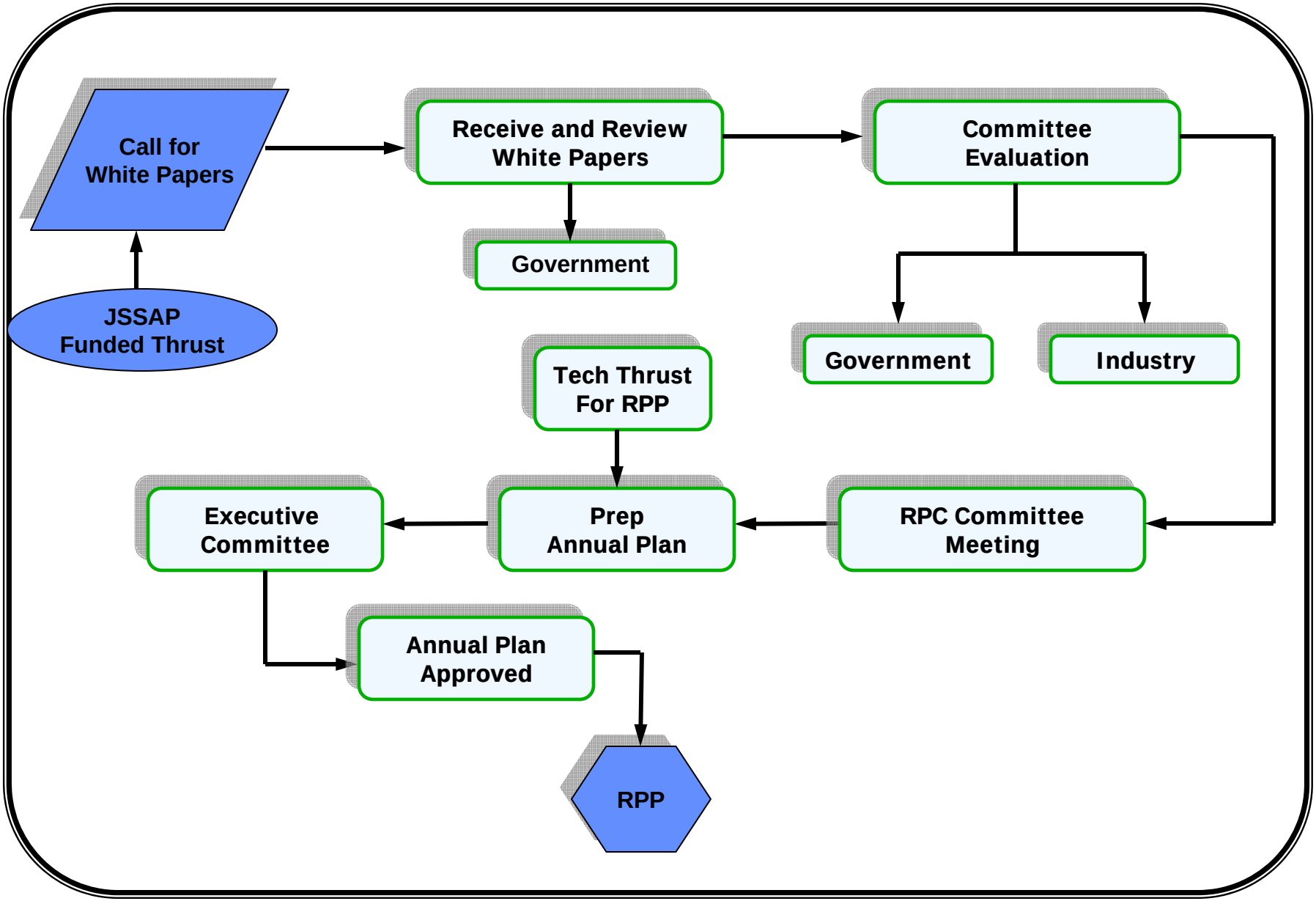
BUSINESS DEVELOPMENT PROPOSALS

- **RECEIVED 30 ACCEPTABLE PROPOSALS FOR FISCAL YEAR 2007**
- **SCHEDULE:**
  - **REQUEST FOR PROPOSALS CLOSED - JANUARY 31, 2007**
  - **COMPLETED EVALUATION - APRIL 12, 2007**
  - **VISITING JSSAP, PEOs AND PMs TO RAISE FUNDS FOR PROPOSALS - APRIL 23rd TO MAY 18th**
  - **NEGOTIATIONS WITH OFFERORS AS FUNDS ARE FOUND**
- **UNFUNDED ACCEPTABLE PROPOSALS WILL BE RETAINED FOR TWO YEARS AWAITING POTENTIAL CUSTOMERS**

PATH FORWARD

- **ENCOURAGE STRONG MEMBER PARTICIPATION**
  - **WHITE PAPERS**
  - **RESEARCH SUBCOMMITTEES**
  - **BUSINESS DEVELOPMENT COMMITTEE**

White Paper Process



PATH FORWARD

- **CREATE AN AWARENESS OF AND INTEREST IN THE CONSORTIUM BY PEOs, PMs AND ENGINEERING CENTERS OF *ALL SERVICES***

- **KEEP OUR ELECTED OFFICIALS INFORMED ON THE PROGRESS AND BENEFITS OF THE CONSORTIUM**

BOTTOM LINE: SUPPORT THE NEEDS OF OUR WARFIGHTERS

THANK YOU!!!

GENERAL DYNAMICS
Ordnance and Tactical Systems

St. Marks Powder

A General Dynamics Company

May 9, 2007






OBJECTIVE

- Develop and optimize BALL POWDER® Propellant to achieve an additional 130 feet per second over current offerings, but also offers added benefits such as:

✓Low flame temperature for extended barrel life.

✓Excellent ignition for low velocity standard deviation.

✓Flash suppression.

✓Lower charge weight for reduced fouling.

Company Proprietary Information

.338 Lapua Magnum vs. M118 LR

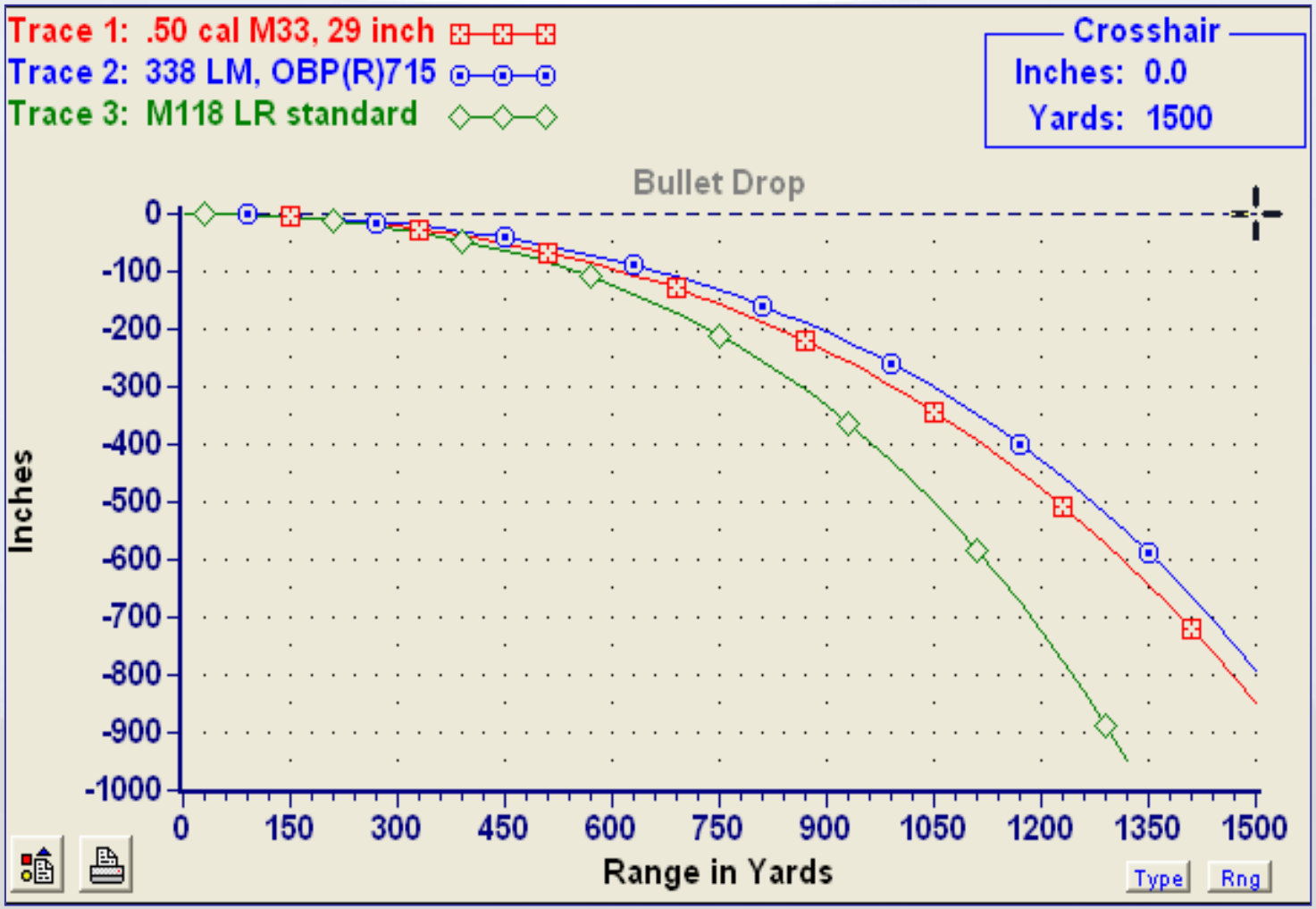


Weapon Constraints

- Weapon designed for 65,000 psi cartridge.
- Desired operating pressure of 62,500 psi.
- Optimized for single shot bolt action.
- 27.5 or 29.5 inch barrel.
- 1/10 twist barrel.
- Operating temperatures from +150° F to -20° F.
- Testing constraints from +150° F to -65° F.

Company Proprietary Information

Relative Ballistics



Company Proprietary Information

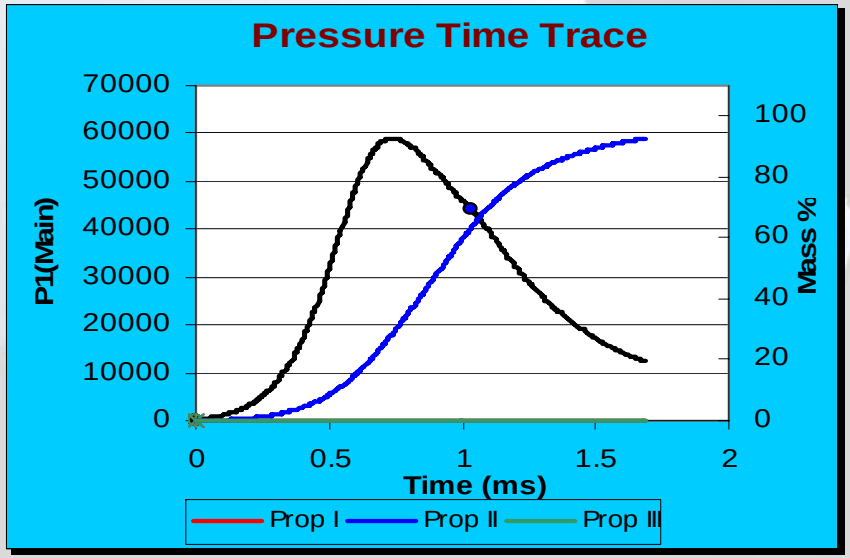
.338 Lapua Magnum High Performance Program
Baseline Ballistic Data, 24 inch Test Barrel

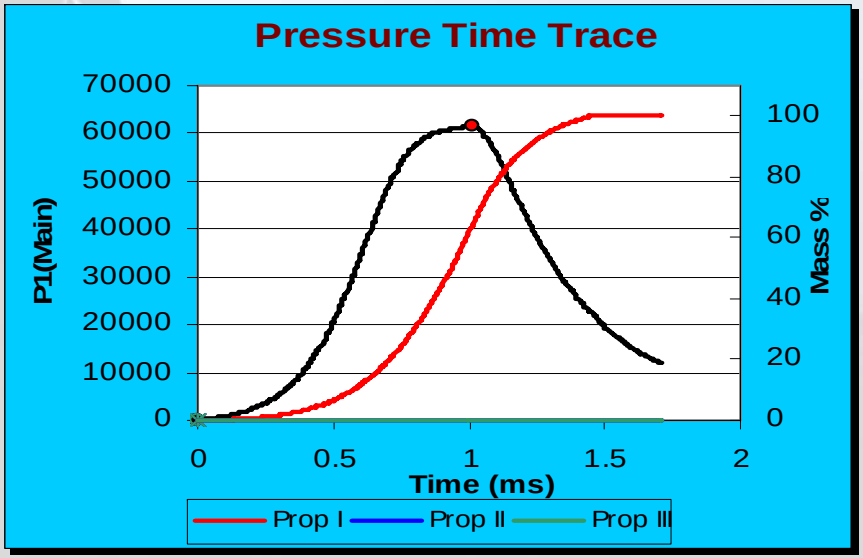
Competitive Propellant

Velocity: 2840 fps
Pressure: 58800 psi
Charge weight: 108 grains

St. Marks Powder OBP® 715

Velocity: 3030 fps
Pressure: 62,200 psi
Charge weight: 101.2 grains





Company Proprietary Information

338 Lapua Magnum High Performance Program
24 inch Test Barrel

- Ambient Velocity: 3030 fps
- Pressure: 62,200 psi
- Charge weight: 101.2 grains

- **Velocity change at temperatures:**

+80 fps at +125° F

-70 fps at -65° F

- **Velocity increase of 190 fps over competitors propellant.**
- **Energy increase of 14% over competitors propellant.**
- **Charge weight reduction of 7%.**

Company Proprietary Information

Real World Ballistics
(27.5 inch barrel for .338 Lapua Magnum)

.338 Lapua Magnum

Velocity: 3160 fps

Ballistic Coefficient: 0.560

100 yard zero

3 MOA at 300 yards

9.75 MOA at 600 yards

22.75 MOA at 1000 yards

1095 ft-lbs energy at 1275 yards

M118 LR

Velocity: 2620 fps

Ballistic Coefficient: 0.496

100 yard zero

5 MOA at 300 yards

16 MOA at 600 yards

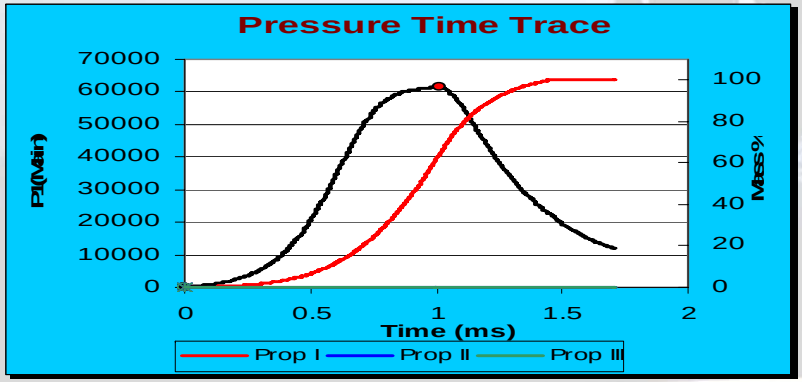
38 MOA at 1000 yards

1095 ft-lbs energy at 600 yards

Company Proprietary Information

SMP® Propellant Technology

- Maximize area under the pressure/time curve.
- 100% propellant burn out.
- Near 100% loading density, but not over filled.
- Propellant optimized for temperature stability and maximum energy inside the cartridge case.
- Flash suppression integrated into propellant.
- Similar propellant chemistry has been DoD safety certified for 25mm M910 ammunition.





RESULTS

- St. Marks Powder propellant achieved increased velocity over all US and European rounds available.
- St. Marks Powder propellant achieved excellent temperature stability.
- BALL POWDER® Propellant meters thru charge plates with precise charge weight repeatability, for consistent velocity in factory rounds, unlike extruded propellant.
- OBP® 715 contains flash suppression for sniper concealment.
- Low flame temperature ensures prolonged barrel life.
- Low charge weight ensures low residue and clean barrels.

Company Proprietary Information

PRECISION, PEOPLE AND TECHNOLOGY

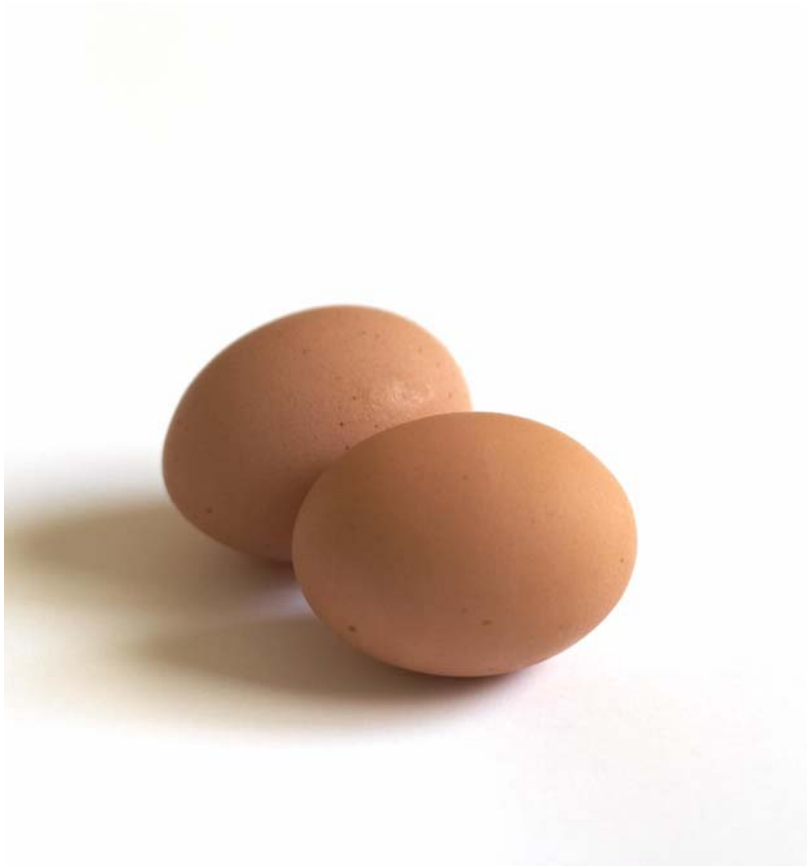


.338 Lapua Magnum
A “New” Cartridge Comes of Age

NDIA Joint Services Small Arms Systems
Annual Symposium and Firing Demonstration
May 7-9, 2007
Bruce Webb, VP Marketing

Nammo

A New Caliber: Which Came First, The Weapon or the Ammo?





The Challenge: Portable Sniping Power

There is a big gap between the common calibers

7.62mmx51 (.308 Win)





- 12lb weapon
  - + Optics
  - + Ammo (M118LR)
- 900m Range
- 175gr projectile

.50 cal (12.7mmx99)





- 30lb weapon
  - + Optics
  - + Ammo (Mk211)
- 1500m Range
- 650gr projectile + MP

US Military Addressed Gap In 1982

Requirement (machine gun, semi-auto & sniper)

- Pre-”SOCOM” units defined need
- Launch 250gr projectile at 3000 fps
- Range 1500m (like .50cal)

NSWC Crane Manager

Research Armament Company lead (gun)

- Brass Extrusion Labs Limited (cartridge case)
- Hornady (projectile)

Armament Research Corporation's "Haskins Rifle" was the Star

- Jerry Haskins' (AR) gun was well received
  - Simplified Action was working in .300 Win Mag and .50 BMG
- ".416-.338" napkin design based on .416 Rigby
  - Ed Dillon designed preliminary mods for .338/.416
  - Boots Obermeyer (barrels) refined interfaces
  - Jim Bell solved cartridge issues & made 'conversion' tooling
- Lapua was chosen as a production partner
  - Agreement made at the 1984 SHOT Show
  - Based on the .416/338 being the "Next Big Thing"

Late 1984, System Problems Surfaced

- Recurring “Headspace” problems
  - Caused by oversize bullet w/Haskins bolt design [Dillon]
- US Military continued with Haskins
  - .300 Win Mag
  - .50 cal
  - but dropped the 416/338
- Lapua, who had signed on for “production” was left at the dance without a date

Lapua Adopted the Program “Alone”

Promises of Production Quantities Faded



Lapua made further refinements (1984-1985)

- Increased web thickness (possible “from scratch”)
- Increased taper (still thinking about machine guns)

Heym (Germany) made .338 ‘semi-custom’ guns (1985)

- Heym’s ’98 style actions solved AR’s problems
- Competitive long-range shooters choose .338 Lapua Mag

Late 1980’s Accuracy International developed a .338 Weapon

- Malcolm Cooper (AI) represented Lapua in Britain
- Developed the Arctic Warfare weapon in 7.62mm and .300 Win Mag
- Migrated the AW to .338 Lapua Magnum become the first production

SAKO had provided test barrels to Lapua, followed

- Fields the TRG-41 in .338 Lapua magnum

.416 Rigby Becomes .338 Lapua Mag



Comments:

Accommodates large, heavy projectile (300-400 grain) for “Dangerous Game”

- Mouth =.416”
- Length = 2.90”
- Volume =122gr H_2O



Comments:

Increased taper for improved extraction

Increased web for higher pressure up to 60,915 psi (420 MPa)

- Mouth = .338”
- Length = 2.72”
- Volume =114gr H_2O

Interesting Things at SOCOM in 2007



.338 Lapua Mag Timeline

1982	.416-.338 Concept (250gr x 3000 fps)
1983	USN/Research Armaments (Haskins)/ BELL (Bell)/Hornaday
1984	SHOT Show Agreement (ARC/Lapua)
1985	Heym (Germany)/Mauser/Lapua
1986	416/338 Begins Winning Competitions
1988	Accuracy International “Production”
1989	CIP Registration
1990 - 2004	Long Range Competitors and European Snipers choose .338 Lapua Magnum
2004 - 2007	Renewed US Sniper Use/Interest
2007	SAAMI Introduction
2007	US Military Qualification Planned ?

The Result: A Refined Example



- 8lb weapon
  - + Optics
  - + Ammo
- 1500m Range
- 250gr projectile

.338 Lapua Magnum Growing “Family”

Weapons:

- Accuracy Int’l AWSM/AWP (UK)
- SAKO TRG -42 (Finland)
- Timberwolf PGW (Canada)
- Remington M24A3
- SIG Blaser LRS2 (Switzerland)
- Many Others

Ammunition:

- Lapua
- Norma
- RUAG
- Black Hills

Countries:

- Australia
- Belgium
- Britain*
- Canada
- Finland*
- Germany
- Ireland
- Netherlands
- Norway
- Singapore
- Switzerland
- United States

Special Thanks to:

- Ed Dillon at Nostalgia Enterprises Company
  - High accuracy chronographs
- Jim and Jay Bell at MAST Technologies
- Janne Pohjoispää & Nammo Lapua Oy staff



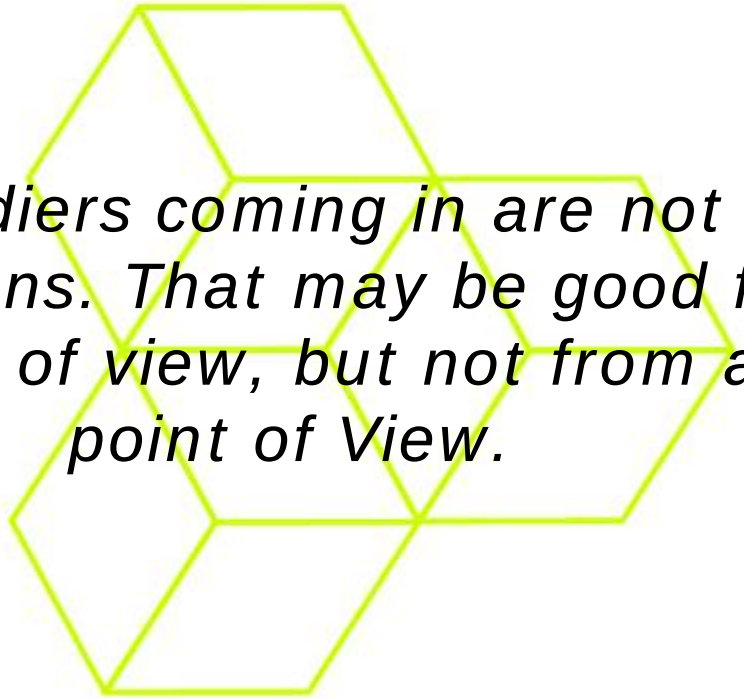
Transforming Small Arms Maintenance Training Through Virtual Task Trainers

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May 9, 2007

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Our new soldiers coming in are not familiar with weapons. That may be good from a society point of view, but not from an Army point of View.

General William S. Wallace,
Commanding General US Army Training and Doctrine Command

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Agenda

- Environment
- Current Methods of Training
- Virtual Task Trainers
- Case Studies
- Summary

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Environmental Factors

- High Operational Tempo
- Immediate Fielding of Equipment
- Reduced Residency Time
- Soldiers Tasked with New Duties
- Systems & Weapons used in harsh environments beyond their planned retirement



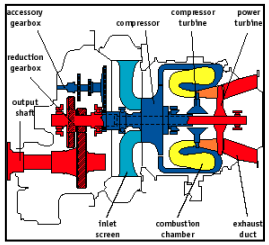


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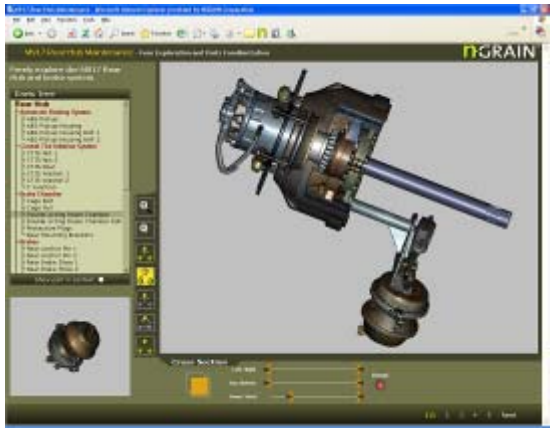
Methods of Hard Skills Training



Text



Multimedia



Interactive 3D Simulations



Hard Trainers

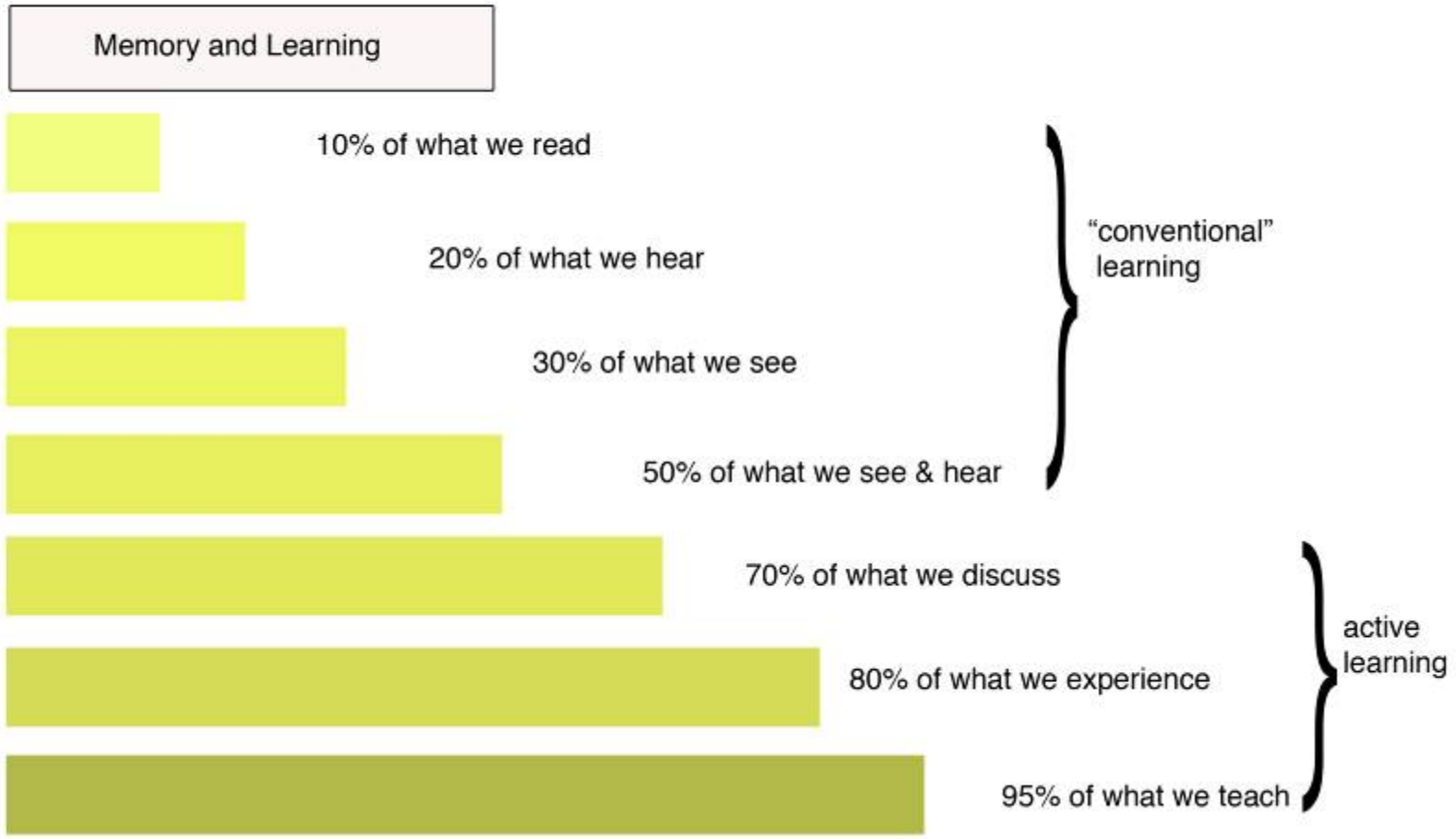


Live Equipment

Text	Interactive 3D Simulations	Hard Trainers	Live Equipment
✓Low cost	✓Low cost	×High cost	
✓Easy to create and update	✓Easy to create and update	×Difficult to create and update	
✓Anytime, anywhere access	✓Anytime, anywhere access	×Limited access	
×Low learning effectiveness	✓High learning effectiveness	✓High learning effectiveness	

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Learning Theory



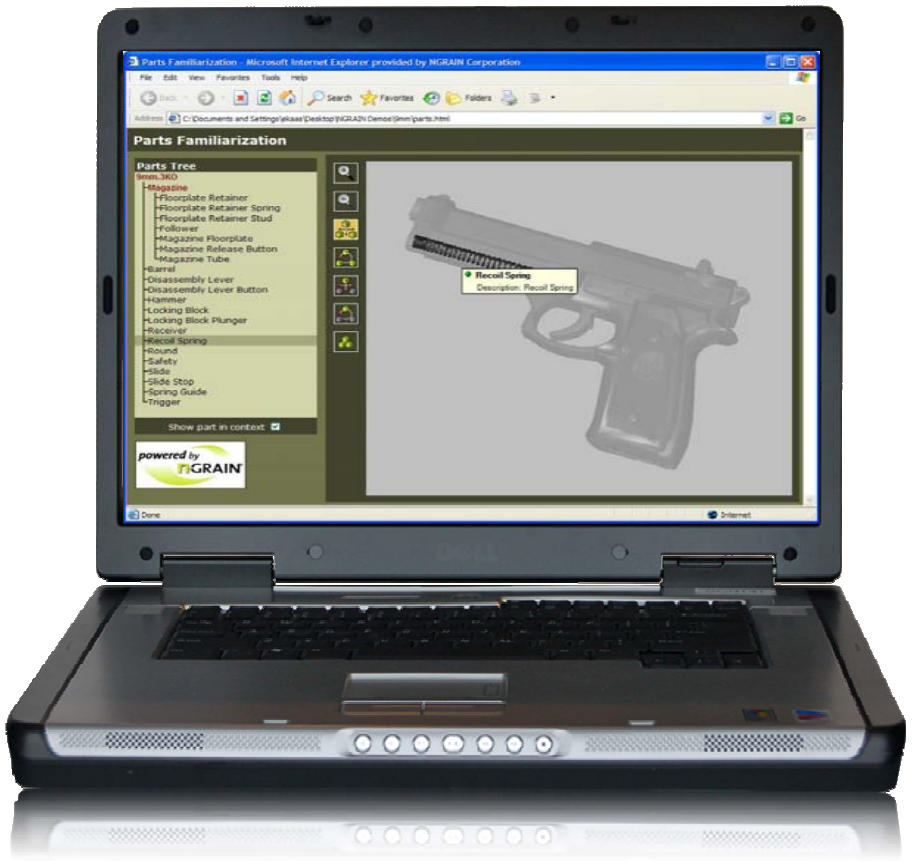
Source: Airbus / Journal for Civil Aviation Training (Issue 1 / 2006)

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Virtual Task Trainer

- Virtual 3D equipment simulations to:
  - *Familiarize*
  - *Acquire*
  - *Practice*
  - *Test and Validate*

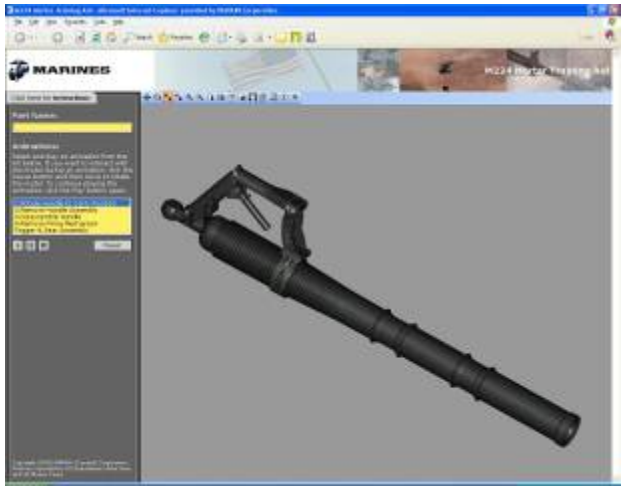
- **ROI: Train 60% Faster**



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Benefits of Virtual Task Trainers

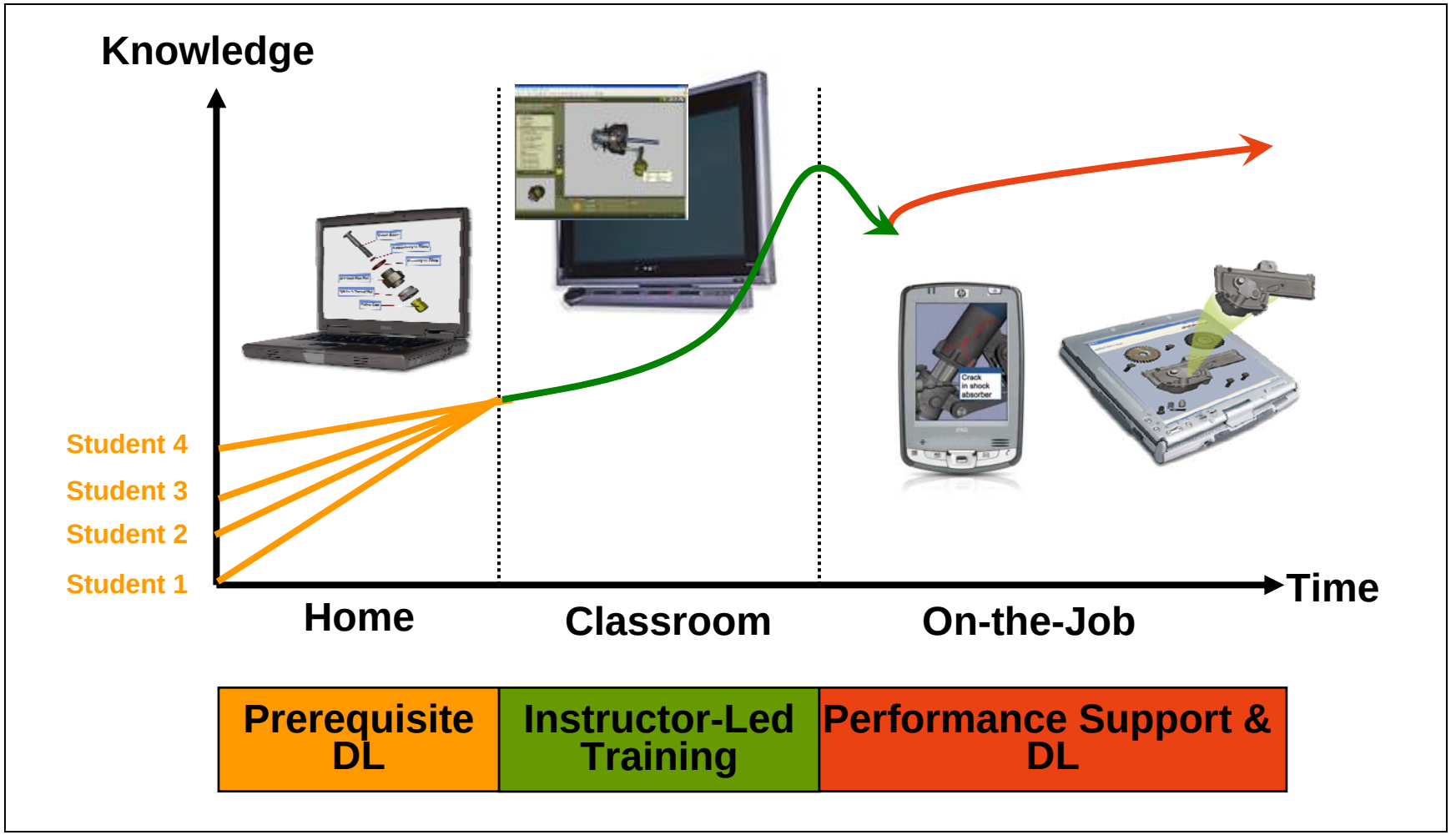
- ✓ Let students learn from their mistakes, **safely**
- ✓ Let training take place **without the expense** of equipment
- ✓ Train **more efficiently**
- ✓ **Reduce wear and tear** on equipment
- ✓ Enable **task-based, on-the-job training**





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Supporting the Lifelong Learning Continuum

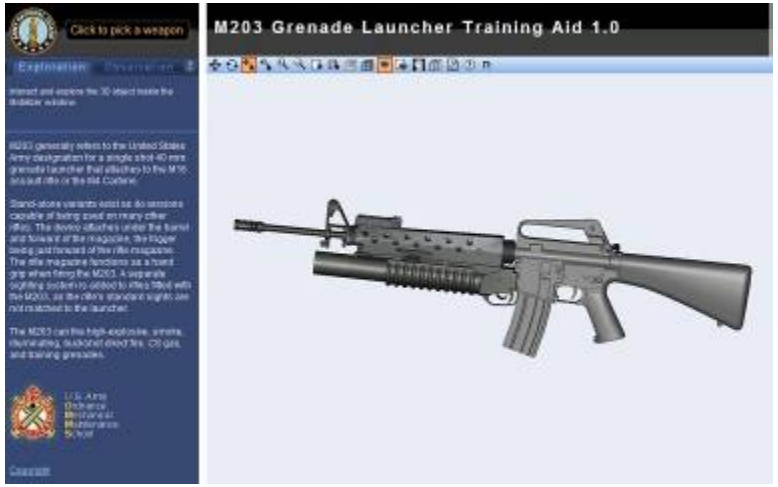


Source: VERTEX Solutions, Inc. 2002

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Weapons Virtual Task Trainer for the US Army National Guard

- **Challenge:**
  - Difficult for instructors to demonstrate assembly and disassembly procedures
- **Objective:**
  - Improve classroom and self-paced study of individual arms
- **Results**:
  - Increased knowledge of maintenance and assembly/disassembly procedures of small arms





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ARNG Weapons Training Aid 1.0

M240 Machine Gun



explore weapon | view animations

M249 Squad Automatic Weapon



explore weapon | view animations

M240B Machine Gun



explore weapon | view animations

M2 Machine Gun



explore weapon | view animations

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M107 Sniper Rifle



explore weapon | view animations

M203 Grenade Launcher



explore weapon | view animations

M590 Shotgun



explore weapon | view animations

MK19 Grenade Launcher

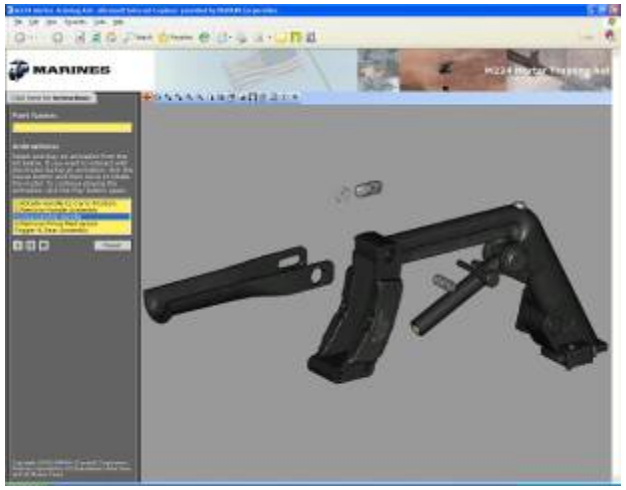


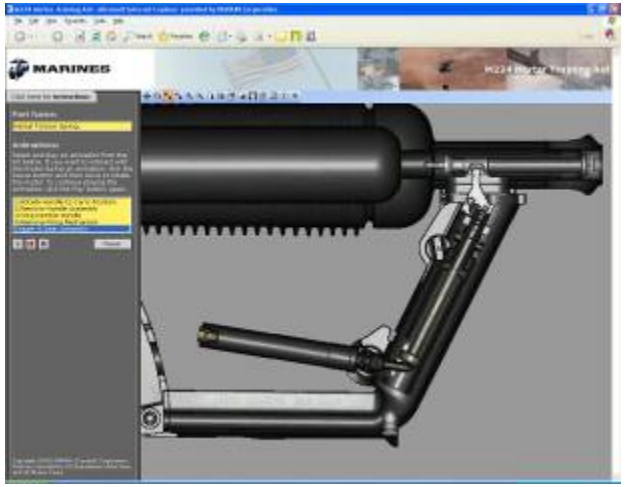
explore weapon | view animations

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M224 Mortar Virtual Task Trainer for the US Marine Corps

- **Challenge:**
  - Inability for “dummy” weapon trainers to show operation of internal parts
  - High breakage rates
- **Objective:**
  - Effectively train students on equipment internals and interactions
  - Reduce breakage and associated costs
- **Results**:
  - Improved training, including internals
  - Reduced equipment replacement costs





Summary

- Virtual task trainers offer numerous benefits:
  - Lets training take place even if there is no equipment available
  - More effective for task-based learning objectives
  - Operationally deployable
  - Very suitable for training on internal components

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Thank You. Questions?

- For more information:
  - Email Troy Welch: twelch@ngrain.com
  - Go to www.ngrain.com for case studies

